U.S. DEPARTMENT OF THE INTERIOR
**BUREAU OF LAND MANAGEMENT**

May 2019

# Buffalo Field Office

## Draft Supplemental Environmental Impact Statement and Resource Management Plan Amendment

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Buffalo Field Office
1425 Fort Street,
Buffalo, Wyoming 82834
www.blm.gov/wy/

Dear Reader:

Enclosed is the draft Supplemental Environmental Impact Statement and Resource Management Plan Amendment (SEIS/RMPA) to the Bureau of Land Management (BLM) Buffalo Field Office's (BFO) 2015 Approved Resource Management Plan (RMP)/Final Environmental Impact Statement. The BFO prepared the draft SEIS/RMPA in response to the United States District Court, District of Montana, opinion and order, *Western Organization of Resource Councils, et al. v. BLM*.

The BFO developed the draft SEIS in consultation with government agencies and organizations. This SEIS/RMPA is needed for the following reasons:

- To consider an alternative that would reduce the amount of recoverable coal and consider climate change impacts; this is done to make a reasoned decision on the amount of recoverable coal made available
- To supplement the analysis of the environmental consequences of downstream combustion of coal, oil, and gas open to development
- To justify the time horizon of the estimated global warming potential impacts over the next 20 or 100 years, and to acknowledge the evolving science in this area

The purpose of this SEIS/RMPA is to provide additional analysis for land use planning, specifically for analyzing downstream combustion of coal, oil, and gas from the BFO, and to determine the lands to be made available for coal leasing. To support the analysis in the SEIS/RMPA and in subsequent decision-making, the BLM has conducted new coal screening, in accordance with 43 Code of Federal Regulations 3420.1–4.

The BLM encourages the public to provide information and comments pertaining to the analysis presented in this draft SEIS/RMPA. The BLM is particularly interested in feedback concerning the adequacy and accuracy of the reduced coal alternative, the analysis of environmental consequences of downstream combustion, and the justification and explanation of the 20-year and 100-year global warming potentials. The BLM also solicits any new information that would help it develop the final SEIS/proposed RMPA.

The BLM will accept comments for 90 calendar days following the Environmental Protection Agency's publication of its Notice of Availability in the *Federal Register*. The BLM can best use your comments and resource information submissions if it receives them within the review period.

You may submit comments electronically on the project website: https://go.usa.gov/xP6S3; through the project email address: blm_wy_bfo_coal_seis@blm.gov; or you can mail them to Bureau of Land Management, Buffalo Field Office, c/o Thomas Bills, 1425 Fort Street, Buffalo, WY 82834-2436. To facilitate analysis of comments and information submitted, the BLM strongly encourages you to submit comments in an electronic format.

Your review and comments on the content of this document are critical to the success of this planning effort. If you wish to submit comments, the BLM requests that you make them as specific as possible. Comments will be more helpful if you include suggested changes, sources, or methods and reference a section or page number. The BLM will consider comments containing only opinions or preferences and will include them as part of the decision-making process; however, the BLM will not respond formally to those comments.

Before including your address, phone number, email address, or other personal identifying information in your comment, be advised that your entire comment—including your personal identifying information—may be made publicly available at any time. While you can ask the BLM in your comment to withhold your personal identifying information from public review, it cannot guarantee that they will be able to do so.

Public meetings to provide an overview of the document, to respond to questions, and to take public comments will be announced via such outlets as local media, a website, or public mailings at least 15 days in advance.

The BLM has sent copies of the draft SEIS/RMPA to affected federal, state, and local government agencies. Copies are also available for public inspection on the BLM website at https://go.usa.gov/xP6S3 and at the following BLM locations:

Bureau of Land Management
Wyoming State Office
5353 Yellowstone Road
Cheyenne, WY 82009-4178

Bureau of Land Management
Buffalo Field Office
1425 Fort Street
Buffalo, WY 82834-2436

Thank you for your continued interest in the draft SEIS/RMPA. The BLM appreciates the information and suggestions you contribute to the planning process. For additional information or clarification regarding this document or the planning process, please contact Thomas Bills at (307) 684-1133.

Sincerely,

Todd D. Yeager

Todd Yeager
Buffalo Field Manager
Bureau of Land Management

# Draft Supplemental Environmental Impact Statement and Resource Management Plan Amendment Buffalo Field Office, Wyoming

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|---|---|---|
| Responsible Agency: | United States Department of the Interior<br>Bureau of Land Management | |
| Type of Action: | Administrative (X) | Legislative ( ) |
| Document Status: | Draft (X) | Final ( ) |

Abstract: This draft supplemental environmental impact statement (SEIS) and Resource Management Plan Amendment (RMPA) augments analysis for the 2015 Buffalo Field Office Approved Resource Management Plan (RMP). In it, the Bureau of Land Management Buffalo Field Office analyzed a new reduced coal alternative, supplemented the analysis of coal, oil, and gas downstream emissions, and provided justification for the time horizons chosen for analyzing global warming potential. The potential RMPA is limited to amending the coal leasing availability decision from the 2015 Approved RMP.

The Bureau of Land Management is the lead agency for this draft SEIS/RMPA, with 12 cooperating agencies initially participating in the plan development: the Campbell County Commission, Johnson County Commission, Sheridan County Commission, Campbell County Conservation District, Wyoming State Historic Preservation Office, Wyoming Office of the Governor, Wyoming Department of Agriculture, Wyoming Department of Environmental Quality, Wyoming Game and Fish Department, United States Environmental Protection Agency (EPA) Region 8, the Office of Surface Mining, Reclamation, and Enforcement, and the US Fish and Wildlife Service.

In this Draft SEIS/RMPA the BLM analyzed two alternatives. Alternative A, the no action alternative, continues management decision for coal leasing availability, with updated data on which the 2015 Proposed RMP/Final EIS was based, and an updated reasonably foreseeable development scenario. Alternative B would modify the management decision for coal leasing availability under the 2015 Proposed RMP/Final EIS, with an updated economic analysis and coal screens. Planning issues addressed leasable minerals, greenhouse gases, climate change, biological resources, and economics.

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United States Department of the Interior

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# **ERRATA**

In the Air Resources, Including Greenhouse Gases and Climate Change analysis for the Draft RMPA/SEIS, some conversion factors and inputs were mistyped, resulting in incorrect greenhouse gas emissions.

Table 3-4 for federal coal is being corrected because there was an error in converting between short tons and metric tons for some years. Annual average greenhouse gas emissions for federal coal production were reported as 4.8 instead of 5.2 million metric tons per year. This discrepancy is approximately 0.1 percent of the cumulative RMPA emissions.

Table 3-5 for oil is being corrected because there was a decimal point error in the conversion factor used for carbon dioxide gas in the "combustion" column. Annual average greenhouse gas emissions for federal oil combustion were reported as 0.3 instead of 2.6 million metric tons per year. This discrepancy is approximately 0.5 percent of the cumulative RMPA emissions.

Table 3-6 for federal conventional natural gas is being corrected because of a mistype in the production used to estimate downstream combustion emissions for some years. Annual average greenhouse gas emissions for federal conventional natural gas combustion were reported as 0.46 instead of 0.48 million metric tons per year. This discrepancy is approximately 0.005 percent of the cumulative RMPA emissions.

Table 3-7 for coalbed natural gas has no errors and is not being corrected.

The column in Table 3-6 and 3-7 showing natural gas production in billion cubic feet is being removed as it showed total natural gas which does not inform the emissions data in other columns.

Table 3-8 is being corrected because of the error in federal oil combustion (reported above for Table 3-5) and a similar error in the non-federal oil combustion emission calculation that resulted in that value being reported as 0.3 instead of 2.7 million metric tons per year. These discrepancies together are approximately 1 percent of the cumulative RMPA emissions.

Table 3-8 is also being corrected because of an error in non-federal conventional natural gas combustion greenhouse gas emissions. Annual average emissions were reported as 3.4 instead of 6.8 million metric tons per year. This discrepancy is approximately 0.8 percent of the cumulative RMPA emissions.

Table 3-9, a summary table, is being corrected to address the discrepancies listed above. Annual average greenhouse emissions from federal sources were reported as 386.0 instead of 388.3 million metric tons per year. Thus, the error across all federal sources is approximately 0.5 percent of the cumulative RMPA emissions. Annual average non-federal emissions were reported as 60.5 instead of 66.3 million metric tons per year. Thus, the error across all non-federal sources is approximately 1.3 percent of cumulative RMPA emissions.

Table C-2 for federal oil in the Appendix provides the supporting data for Table 3-5 discussed above and hence is being corrected for the same reason as Table 3-5.

Table C-3 for federal conventional natural gas in the Appendix provides the supporting data for Table 3-6 discussed above and hence is being corrected for the same reason as Table 3-6.

The column in Tables C-3 and C-4 in the Appendix showing natural gas production in billion cubic feet is being removed for the same reason as the gas production column in Tables 3-6 and 3-7 discussed above.

Section 3.5.1 and Appendix C have been updated accordingly and are included with this errata sheet below. The only changes made are in Section 3.5.1 and Appendix C and are shown in gray shading below.

### 3.5.1 Air Resources, including Greenhouse Gases and Climate Change

The BLM air resources program includes air quality, air quality related values such as visibility and deposition, and greenhouse gases and climate change. Because the management actions being evaluated in this SEIS would not affect the air quality and air quality related values analyses contained in the 2015 Proposed RMP/Final EIS (BLM 2015) and these were not the subject of the court order, the analysis here focuses on greenhouse gases and climate change.

#### *Affected Environment*

This section incorporates by reference the affected environment described in the 2015 Proposed RMP/Final EIS (Section 3.1.1.6, Climate Change, pp. 318–324). More recent information as it pertains to the decisions for this SEIS/RMPA is included below.

The Intergovernmental Panel on Climate Change (IPCC) defines climate change as "a change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties, and persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forcing such as modulations of the solar cycles, volcanic eruptions and persistent anthropogenic changes in the composition of the atmosphere or in land use" (IPCC 2013).

The IPCC states: "Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, sea level has risen, and the concentrations of greenhouse gases have increased" (IPCC 2013). The global average surface temperature has increased approximately 1.5 degrees Fahrenheit (°F) from 1880 to 2012 (IPCC 2013). Warming has occurred on land surfaces, oceans and other water bodies, and in the troposphere, which is the lowest layer of earth's atmosphere, ranging from 4 to 12 miles above the surface. The troposphere is where all the weather phenomena we experience on a daily basis occurs.

Current ongoing global climate change is caused, in part, by the atmospheric buildup of greenhouse gases (GHGs), which may persist for decades or even centuries. Although largely invisible to the short wavelength incoming solar radiation that heats the earth's surface, GHGs absorb a portion of the outgoing long wavelength infrared heat radiated back from the surface; this prevents it from escaping into space. As a result, the buildup of GHGs, such as carbon dioxide, methane, and nitrous oxide, since the start of the Industrial Revolution has increased the global mean temperature and begun to alter the earth's climate in complex ways.

This section analyzes the three main GHGs (carbon dioxide [$CO_2$], nitrous oxide [$N_2O$], and methane [$CH_4$]) associated with the production, transportation, and downstream combustion of coal, oil, and gas over the life of the Buffalo Field Office SEIS/RMPA. The analysis responds to the GHG and climate change-related issues identified in the United States District Court, District of Montana, opinion and order (*Western Organization of Resource Councils, et al. vs. BLM*) and issues identified through scoping. These issues are identified in **Chapter 1**, Purpose and Need, and in **Table 1-1**, Scoping Issues and the Resource Topics Affected. The court order requires the BLM to supplement the 2015 Proposed RMP/Final EIS analysis to evaluate the environmental consequences of the downstream combustion of coal, oil, and gas open to potential development (claim #3), to justify the use of global warming potential (GWP) time horizons, and to explain the evolving science in this area (claim #5).

The method the BLM used to supplement the GHG and climate change analysis accordingly is described below. **Section 2.2**, Alternatives Development, addresses coal screening and consideration of climate change impacts used to make a reasoned decision on the amount of recoverable coal acceptable for further consideration for leasing in this RMP (claim #1).

Different GHGs have different atmospheric lifetimes; some, such as methane, react in the atmosphere relatively quickly, on the order of 12 years (see EPA 2018a), whereas others, such as carbon dioxide typically last for hundreds of years or longer. GHGs also vary with respect to the amount of outgoing radiation absorbed by each gas molecule, relative to the amount of incoming radiation it allows to pass through, that is, its level of radiative forcing. A molecule of nitrous oxide is far more effective at absorbing outgoing radiation than a molecule of $CO_2$.

The impact of a given GHG species on global warming depends both on its radiative forcing and how long it lasts in the atmosphere. Climate scientists have calculated a GWP for each GHG that accounts for these effects. GWPs are calculated for each GHG species for a specified time interval, typically 20 or 100 years. By definition, the GWP for $CO_2$ is assigned a value of 1, and GWPs for other gases are defined relative to $CO_2$. In technical terms, GWP is the time-integrated direct (and potentially indirect) radiative forcing of an amount of a GHG species released instantaneously into the atmosphere, relative to that of an equal amount of $CO_2$.

GWP values allow for direct comparison of the impacts of emissions of different GHGs. In particular, emissions of mixtures of different GHGs are typically summarized in terms of their $CO_2$ equivalent ($CO_2e$) emissions, defined as the weighted sum of the emissions of each GHG, where the weights are the GWPs. For example, emissions of the three most significant GHGs associated with fossil fuel combustion ($CO_2$, $CH_4$, and $N_2O$) are summarized as:

$$CO_2e\ (MMT/yr) = CO_2(MMT/yr) + GWP_{CH4} \times CH_4(MMT/yr) + GWP_{N2O} \times N_2O(MMT/yr)$$

where MMT stands for million metric tons.

Because the GWP of a given GHG depends in part on the atmospheric lifetime of the GHG, GWP values depend on the time interval for which they are estimated. The GWP for a relatively short-lived GHG, such as $CH_4$, is larger over a short period, say, 20 years, compared with a much longer period, such as 100 years. This is because most of the $CH_4$ will have reacted away well before 100 years have passed. Conversely, long-lived GHGs have a 20-year GWP that is lower than the 100-year GWP. This is because the time integrated radiative forcing is less (relative to $CO_2$) over the shorter time interval.

As a result of various complex feedbacks in the earth-atmosphere system, GWPs can only be roughly estimated; according to the IPCC (2013), GWPs typically have an uncertainty of ±35 percent. Estimates of GWPs have been updated over the years as the models used to calculate them have been refined. The updated estimates also reflect the changing composition of the atmosphere, which affects the GWP of each additional ton of GHG emissions.

GWPs have been calculated for several GHGs over different time horizons, including 20 years, 100 years, and 500 years. The choice of time horizon depends on the type of application and policy context; hence, no single time horizon is optimal for all policy goals. The United Nations Framework Convention on Climate Change and its Kyoto Protocol[1] adopted the 100-year GWP, which is used widely as the default metric. The

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[1] https://unfccc.int

US Environmental Protection Agency (EPA) uses the 100-year time horizon in its annual GHG inventories; the EPA's most recent inventory (2019a) uses 100-year GWPs consistent with the IPCC Fifth Assessment Report.

For this SEIS/RMPA, the BLM reports $CO_2e$ emissions using GWPs for the 100-year time horizon. This was done for consistency with the EPA's inventory. It also reports $CO_2e$ emissions using GWPs for the 20-year time horizon to more clearly estimate the relative impacts of shorter lived GHGs, such as $CH_4$, over the 20-year life of the RMP. More information on specific GWPs and time horizons used for this SEIS/RMPA analysis is in the section below on *Direct and Indirect Impacts, Analysis Methods.*

### *Physical Manifestations of Climate Change*

Warming of the earth's climate since the Industrial Revolution has been observed to coincide with widespread effects throughout the earth-atmosphere system, including reductions in extent and duration of polar sea ice and mountain winter snowpack, rising sea levels, increases in mean nighttime minimum temperatures, shifts in historical rainfall patterns, and changes in the frequency, severity, and duration of extreme weather events. These effects in turn have affected natural and human systems, regardless of cause, implicating the sensitivity of natural and human systems to changing climate (IPCC 2013).

The potential effects of climate change, as reported in the Northwestern Plains Rapid Ecoregional Assessment and the Third National Climate Assessment (NCA; published in 2014), were described in the 2015 Proposed RMP/Final EIS (Section 3.1.1.6, Climate Change, pp. 318–321). The Fourth NCA was published in November 2018. It was written to help inform decision-makers, utility and natural resource managers, public health officials, emergency planners, and other stakeholders by providing a thorough examination of the effects of climate change in the United States (USGCRP 2016). The National Oceanic and Atmospheric Administration summarizes some of the key findings of the report by stating that the US is increasingly vulnerable to climate change and, while societal responses to climate change have expanded, they are not yet at the scale needed to avoid substantial impacts (NOAA 2018). Compared with previous reports, the Fourth NCA provides greater detail on regional scales. This is because impacts and adaptation tend to be realized at a more local level.

As reported in the Fourth NCA, climate model projections show a warmer future in the northern Great Plains (Montana, Wyoming, North Dakota, South Dakota, and Nebraska), with conditions becoming consistently warmer in 2 to 3 decades and temperatures rising steadily toward the middle of the century, irrespective of the climate scenario modeled. The Fourth NCA relies on recent climate modeling scenarios, developed by the integrated assessment modeling community and known as the representative concentration pathways (RCP). The lower scenario assumes lower emissions and concentrations of GHGs and aerosols and projects a lower change in radiative forcing by 2100. The higher scenario assumes a continued dependence on fossil fuels and higher GHG emissions and concentrations; it projects a larger change in radiative forcing by 2100.

For the Northern Great Plains, the Fourth NCA reports that temperature increases of 2°F to 4°F projected by 2050 under the lower scenario are expected to increase the occurrence of both drought and heat waves; these projected trends would be greater under the higher scenario. The probability for more hot days, with maximum temperatures above 90°F, is expected to increase. There are projected to be many fewer cool days, with minimum temperatures less than 28°F, which will decrease by 30 days or more per year by mid-century.

The amount, distribution, and variability of annual precipitation are anticipated to change, with increases in winter and spring precipitation of 10 to 30 percent by the end of this century and a decrease in the amount of precipitation falling as snow under a higher scenario. Summer precipitation is expected to vary across the northern Great Plains, ranging from no change under a lower scenario to 10 to 20 percent reductions under a higher scenario. Further, the frequency of heavy precipitation events is projected to increase by about 50 percent in the frequency of 2-day heavy rainfall events by 2050 under the higher scenario. The amount falling in single day heavy events is projected to increase by 8 to 10 percent by mid-century, depending on the scenario. While there is high confidence in future increases in temperature, uncertainties exist as to the degree of precipitation variability from year to year and within season (Conant et al. 2018).

*Greenhouse Gas Emissions in Context*

GHG emissions are reported at a number of spatial scales, including globally, nationally, and at the state level. In addition to these scales (described under *Direct and Indirect Impacts*, *Analysis Methods* for the emission scales used for this analysis), GHG emissions from fossil fuels produced on federal lands and emissions reported in the three planning area counties are described below. A comparison of GHG emissions at differing scales provides context against which to compare emissions from a specific action, such as that evaluated in this SEIS/RMPA.

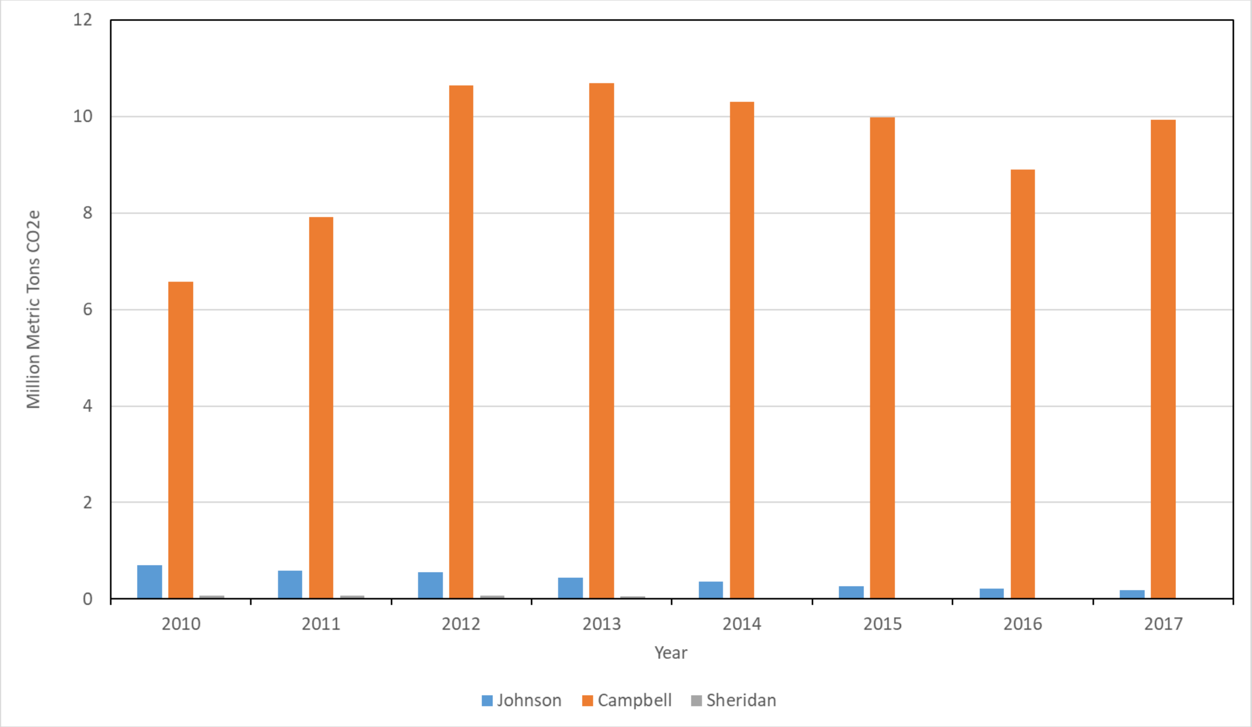
The US Geological Survey (2018) published a report on GHG emissions from extraction and use of fossil fuels produced on federal lands and GHG sinks (carbon storage by terrestrial ecosystems) on federal lands in the US. In 2014, nationwide emissions from oil, gas, and coal extracted from federal lands were 1,279.0 million metric tons (MMT) $CO_2e$ of carbon dioxide, 47.6 MMT $CO_2e$ of methane, and 5.5 MMT $CO_2e$ of nitrous oxide, based on 100-year GWPs. GHG emissions from production and combustion of fossil fuels produced on federal lands in Wyoming were 727.7 MMT $CO_2e$ of carbon dioxide (this is 57 percent of total carbon dioxide emissions from all states and offshore areas combined) and 13.1 MMT $CO_2e$ of methane (this is 28 percent of total methane emissions from all states and offshore areas combined) (USGS 2018). Wyoming had the highest percentage of carbon dioxide and methane emissions from fuels produced on federal lands of all states and offshore regions (USGS 2018).

In 2014, carbon storage by terrestrial ecosystems on federal lands in the conterminous United States (not including Alaska and Hawaii) was 83,600 MMT $CO_2e$. Soils stored 63 percent of carbon, with vegetation and dead organic matter storing 26 percent and 11 percent, respectively. Between 2005 and 2014, the annual rate of net carbon uptake by terrestrial ecosystems in the conterminous US ranged from a sink (sequestration) of 475 MMT tons of $CO_2e$ per year to a source (emission) of 51 MMT $CO_2e$ per year. This was due to such factors as changes in climate and weather, land use, land cover change, and wildfire frequency. Terrestrial ecosystems on federal lands sequestered an average of 195 MMT $CO_2e$ per year nationally between 2005 and 2014. In Wyoming, the annual average sequestration over the 10-year period was 10 MMT $CO_2e$. The 2014 net emissions of GHG for federal lands in Wyoming were 701.5 MMT $CO_2e$ per year, indicating that more GHGs were emitted than were sequestered. This was the largest net emissions of any state by a factor of 10 (USGS 2018).

In its facility level information on greenhouse gases tool (FLIGHT), the EPA (2018b) reports annual GHG emissions from facilities emitting more than 25,000 metric tons of $CO_2e$ that are subject to the EPA's Greenhouse Gas Reporting Program (GHGRP) under 40 CFR Part 98. This includes emissions from most large stationary sources of GHGs (smaller emitters are not required to report) and emissions from most end uses of fossil fuels. Nationally, the GHGRP accounts for 85 to 90 percent of total GHG emissions in the

EPA's *Inventory of US Greenhouse Gas Emissions and* Sinks.[2] While $CH_4$ emissions from underground coal mines are included in the GHGRP, emissions from coal strip mines are not. GHG emissions reported under GHGRP by facilities in the three planning area counties for 2010 to 2017 are shown in **Figure 3-2**. Nearly all of the reported emissions for Campbell County are from coal-fired power plants, while all of the reported emissions in Johnson County are from petroleum and natural gas systems. Reported emissions in Sheridan County are negligible, compared with Campbell and Johnson Counties.

**Figure 3-2. GHG Emissions in the Three Planning Area Counties (EPA 2018b)**



### *Direct and Indirect Impacts*

*Analysis Methods*

This section analyzes the three main GHGs—carbon dioxide, nitrous oxide, and methane—associated with the production, transportation, and downstream combustion of coal, oil, and gas over the life of the Buffalo Field Office SEIS/RMPA. The analysis responds to the GHG and climate change-related issues identified in the United States District Court, District of Montana, opinion and order (*Western Organization of Resource Councils, et al. vs. BLM*) and issues identified through scoping. Details of the method used to supplement the GHG and climate change analysis with regard to claim #3 and claim #5 of the court's decision are described below. Coal screening and consideration of climate change impacts used to make a reasoned decision on the amount of recoverable coal acceptable for further consideration for leasing in the SEIS/RMP (claim #1) is addressed in **Section 2.2**, Alternatives Development.

**Coal.** Emissions of GHGs are quantified for the estimated future production, transportation, and downstream combustion of federal coal developed within the planning area over the life of the plan. GHG emissions for coal production on federal lands are calculated from the default coal methane emissions factor for surface mines in EPA's *State Inventory and Projection Tool*[3] for Wyoming and the BLM RFD forecast for 2019–2038 (**Appendix B**).

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[2] https://www3.epa.gov/climatechange/ghgemissions/inventoryexplorer/data_explorer_flight.html

Transportation emissions are estimated for the transport of produced coal via rail using diesel locomotives. An average one-way train haul distance of 1,115 miles was assumed and emissions were calculated using the RFD-predicted annual tons of coal and two one-way trips per ton of coal. The production-weighted average train haul distance in miles was estimated by using 2017 coal transport data for the Powder River Basin, Wyoming, obtained from the US Energy Information Administration (EIA) Coal Data Browser (EIA 2019a). Locomotive fuel consumption rates and GHG emission factors used to calculate GHG coal transportation emissions are developed for trains hauling coal and the return trip hauling empty cars. To account for the reduced load on the return trip, when the coal cars are typically empty, fuel consumption is estimated at 21.8 percent of the outbound (loaded) fuel consumption, based on the ratio of the total weight of the unloaded train to that of the loaded train (AAR 2018; BNSF 2019; Union Pacific 2019).

The calculations for trains hauling coal are based on emission factors developed from the Burlington Northern Santa Fe (BNSF) Railway and EPA. BNSF developed a fuel efficiency factor for diesel locomotives of 849 ton-miles per gallon in its 2017 Corporate Responsibility and Sustainability Report (BNSF 2017). The EPA provided emission factors for diesel locomotives of 20.9 pounds per gallon for $CO_2$, 0.0018 pounds per gallon for $CH_4$, and 0.0006 pounds per gallon for $N_2O$, as presented in the Greenhouse Gas Inventory Guidance, Direct Emissions from Mobile Combustion Sources (EPA 2016).

Downstream emissions from federal coal combustion are determined as per claim #3 using GHG emissions factors for stationary combustion of sub-bituminous coal from the EPA Emission Factors for Greenhouse Gas Inventories (EPA 2018c). The emission factors used for $CO_2$, $CH_4$, and $N_2O$ are 1,676 kilograms per short ton, 190 kilograms per short ton, and 28 kilograms per short ton, respectively.

The GHG emissions for production, transportation, and downstream combustion are the same under Alternative A (No Action Alternative) and Alternative B (the action alternative). This is because the same RFD is used in both alternatives.

GHG emissions are adjusted to use GWP values based on both 20- and 100-year time horizons to calculate carbon dioxide equivalents (see **Table 3-2** for a description of the GWPs and scientific relevance of these two time horizons). The 100-year GWPs were selected so that emissions reported here can be directly compared with emissions inventories compiled by the EPA (2019a), which use these same GWPs, and to evaluate the relative long-term effect of emissions. The 20-year GWPs were selected to better evaluate near-term impacts of methane emissions over the life of the SEIS/RMP (see discussion under *Affected Environment*, above). GWPs for other time horizons are not readily available and are not commonly used in the climate change community.

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[3] https://www.epa.gov/statelocalenergy/state-inventory-and-projection-tool

### Table 3-2
### GWPs for 100-Year and 20-Year Time Horizons and Rationale

| Time Horizon | GWP | | | Rationale |
|---|---|---|---|---|
| | $CO_2$ | $CH_4$ | $N_2O$ | |
| 100-Year | 1 | 28 | 265 | Adopted by the United Nations Framework Convention on Climate Change and its Kyoto Protocol and used widely as the default metric; used by EPA in its GHG Inventories and GHG Reporting Rule requirements under 40 CFR 98A; consistent with the IPCC Fifth Assessment Report in its science communications. |
| 20-Year | 1 | 84 | 264 | Prioritizes gases with shorter lifetimes, such as $CH_4$, because it does not consider impacts that happen more than 20 years after the emissions occur. Because all GWPs are calculated relative to $CO_2$, GWPs based on a shorter time frame will be larger for gases with lifetimes shorter than that of $CO_2$ and will be smaller for gases with lifetimes longer than $CO_2$. |

Source: IPCC 2014

Other emissions weighting metrics, such as the global temperature change potential (IPCC 2013), are not commonly used for reporting GHG emissions. Evaluations of the relative importance of emissions of short-lived GHG species relative to $CO_2$ are sensitive to the particular metric used, which should be carefully selected to match the specific policy question being addressed.

The state, national, and global emissions totals of GHGs (see **Table 3-3**) are reported for comparison with the potential direct and indirect impacts of coal mining on BFO federal lands. A comparison with other metrics is provided for additional context.

### Table 3-3
### GHG Emissions at Various Scales

| Spatial Scale (Year) | GHG Emissions | Source |
|---|---|---|
| Wyoming (2017) | 60.4 MMT $CO_2$e per year | EPA 2018b |
| National (2017) | 6,457 MMT $CO_2$e per year | EPA 2019a |
| Global (2010) | 52 gigatonne* per year | IPCC 2014 |

* one gigatonne=a thousand million metric tons

**Oil and Gas.** GHG emissions are quantified for production and downstream combustion of oil, conventional natural gas, and coal bed natural gas (CBNG). The annual production estimates for 2019–2030 are the same as the fluid minerals production forecast for Alternative D in the 2015 Proposed RMP/Final EIS (BLM 2015) and are set equal to the 2030 forecast for years 2031–2038.

Conventional natural gas and CBNG GHG emissions listed in the 2015 Proposed RMP/Final EIS for 2015 and 2024 are each divided by total gas production in 2015 and 2024, respectively. This is done to derive separate GHG emission factors for conventional natural gas and CBNG. Total gas production is used because separate conventional natural gas and CBNG production volumes were not included in the 2015 Proposed RMP/Final EIS (the total gas production is provided in the 2015 Proposed RMP/Final EIS). These conventional natural gas and CBNG GHG emission factors are then applied to the estimated total gas production for each year in the RFD to derive separate annual conventional natural gas and CBNG emissions.

To account for differences in emissions factors between 2015 and 2024, emissions for 2019–2023 are based on the linear interpolation of the 2015 and 2024 emissions factors; emissions for 2024–2038 are based on the 2024 emissions factors. GWP values that reflect 20- and 100-year time horizons (see **Table 3-2**) are used to obtain $CO_2e$ emissions.

Annual oil and gas production estimates are also used to form the basis of the emissions estimates for downstream combustion of oil and gas. Oil and gas combustion emissions are quantified using the EPA GHG emissions factors for stationary source combustion of No. 2 fuel oil and natural gas. GHG emissions due to transportation of oil and gas from the planning area are qualitatively assessed.

The GHG emissions quantified for production and downstream combustion are the same under Alternative A (the No Action Alternative) and Alternative B (the action alternative) because the same RFD is used for both. GHG emissions are reported using both 100-year and 20-year GWPs for reasons noted in the above discussion of coal (claim #5). State, national, and global emissions totals of GHGs from the EPA FLIGHT data (2018b), the EIA 2019 Annual Energy Outlook (2019a), and the IPCC Fifth Assessment Report (2014) are reported for comparison with the potential direct and indirect impacts of oil and gas development and production from federal minerals in the planning area (see **Table 3-3**). A comparison with other metrics is provided for additional context.

Assumptions

- Coal production values for each alternative are based on 2018 coal production and EIA 2019 coal production forecasts for average of high and low economic growth scenarios for Wyoming Powder River Basin low-sulfur sub-bituminous coal production (**Appendix B**).
- Coal will be transported one way by diesel locomotive rail over an average transportation distance of 1,115 miles; the distance was calculated using the EIA 2017 coal distribution from Wyoming.
- Fuel consumption to return empty coal railcars is 21.8 percent of the outbound loaded fuel consumption.
- All future coal produced is combusted in US energy generating units.
- Oil and gas production rates are based on the 2015 Proposed RMP/Final EIS, Alternative D (BLM 2015).

Indicators

- MMT of $CO_2$, $CH_4$, and $N_2O$ and the resulting $CO_2e$ from coal production, transportation, and downstream combustion over the life of the RMP
- MMT of $CO_2$, $CH_4$, and $N_2O$ and resulting $CO_2e$ from oil and gas production, and downstream combustion over the life of the RMP
- GHG emissions from coal, oil, and gas as a percentage of state, national, and global emissions and other metrics
- GHG emission equivalencies from power plants and wind turbines

*Impacts Common to all Alternatives*

Coal

**Table 3-4** summarizes GHG emissions from federal coal production, transportation, and downstream combustion for each forecast year. The details by pollutant ($CO_2$, $CH_4$, and $N_2O$) are shown in **Appendix C**.

### Table 3-4
### GHG Emissions as CO2e from Federal Coal Production, Transportation, and Downstream Combustion, Based on 20-Year and 100-Year GWPs

| Year | Federal RFD Coal Production Rate (MMst)[1] | $CO_2$e (MMT[2], 20-Year GWP) | | | | $CO_2$e (MMT[2], 100-Year GWP) | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Production | Transportation | Combustion | Total | Production | Transportation | Combustion | Total |
| 2019 | 258.6 | 19.11 | 3.98 | 439.51 | 462.60 | 6.37 | 3.96 | 436.76 | 447.09 |
| 2020 | 225.8 | 16.68 | 3.47 | 383.64 | 403.80 | 5.56 | 3.46 | 381.24 | 390.26 |
| 2021 | 217.7 | 16.09 | 3.35 | 369.96 | 389.40 | 5.36 | 3.33 | 367.64 | 376.34 |
| 2022 | 204.7 | 15.13 | 3.15 | 347.88 | 366.16 | 5.04 | 3.14 | 345.71 | 353.89 |
| 2023 | 201.2 | 14.87 | 3.10 | 341.89 | 359.85 | 4.96 | 3.08 | 339.75 | 347.79 |
| 2024 | 204.4 | 15.10 | 3.15 | 347.32 | 365.57 | 5.03 | 3.13 | 345.16 | 353.33 |
| 2025 | 204.7 | 15.13 | 3.15 | 347.94 | 366.22 | 5.04 | 3.14 | 345.76 | 353.94 |
| 2026 | 208.1 | 15.38 | 3.20 | 353.65 | 372.23 | 5.13 | 3.19 | 351.45 | 359.76 |
| 2027 | 204.1 | 15.08 | 3.14 | 346.84 | 365.06 | 5.03 | 3.13 | 344.67 | 352.82 |
| 2028 | 203.4 | 15.03 | 3.13 | 345.69 | 363.85 | 5.01 | 3.12 | 343.53 | 351.66 |
| 2029 | 213.4 | 15.77 | 3.28 | 362.61 | 381.66 | 5.26 | 3.27 | 360.34 | 368.86 |
| 2030 | 221.0 | 16.33 | 3.40 | 375.5 | 395.23 | 5.44 | 3.38 | 373.15 | 381.98 |
| 2031 | 218.0 | 16.11 | 3.35 | 370.42 | 389.88 | 5.37 | 3.34 | 368.11 | 376.82 |
| 2032 | 214.3 | 15.84 | 3.30 | 364.22 | 383.36 | 5.28 | 3.28 | 361.95 | 370.51 |
| 2033 | 211.8 | 15.65 | 3.26 | 359.87 | 378.78 | 5.22 | 3.24 | 357.62 | 366.08 |
| 2034 | 211.5 | 15.63 | 3.26 | 359.45 | 378.34 | 5.21 | 3.24 | 357.20 | 365.65 |
| 2035 | 209.9 | 15.52 | 3.23 | 356.77 | 375.52 | 5.17 | 3.22 | 354.54 | 362.93 |
| 2036 | 210.3 | 15.54 | 3.24 | 357.37 | 376.15 | 5.18 | 3.22 | 355.14 | 363.54 |
| 2037 | 208.9 | 15.44 | 3.21 | 354.95 | 373.60 | 5.15 | 3.20 | 352.73 | 361.07 |
| 2038 | 207.7 | 15.35 | 3.20 | 352.87 | 371.41 | 5.12 | 3.18 | 350.67 | 358.97 |
| **Total** | **4,259** | **314.8** | **65.6** | **7,238.4** | **7,618.8** | **104.9** | **65.2** | **7,193.1** | **7,363.3** |
| **Average** | **213.0** | **15.7** | **3.3** | **361.9** | **398.9** | **5.2** | **3.3** | **359.7** | **368.2** |

Source: Ramboll 2019

[1] MMst: million short tons

[2] MMT: million metric tons

The GHG emissions discussed above would contribute incrementally to global climate change. The lack of precise scientific tools (models with sufficient spatial and temporal resolution) to forecast climate change at local scales limits the ability to quantify accurately the potential future impacts of climate change in the planning area. Furthermore, potential impacts on climate change are influenced by GHG emission sources from around the world, and it is not possible to accurately distinguish the impacts on global climate change from GHG emissions originating just from the planning area; instead, the GHG emissions due to the federal action are compared with state, national, and global GHG emissions, along with other metrics.

Total GHG emissions from federal coal production, transportation, and downstream combustion shown in **Table 3-4** over the 20-year SEIS/RMPA lifetime, based on 20-year and 100-year GWPs are 7,619 MMT $CO_2$e and 7,363 MMT $CO_2$e, respectively. The downstream combustion portion is 7,238 MMT $CO_2$e and 7,193 MMT $CO_2$e, respectively.

Average annual GHG emissions from federal coal production in the planning area shown in **Table 3-4** are 15.7 MMT $CO_2e$ and 5.2 MMT $CO_2e$ for 20-year and 100-year GWPs, respectively. These represent 26 and 8.6 percent of the 60.4 MMT $CO_2e$ total 2017 Wyoming GHG emissions for major facilities, as reported in the EPA FLIGHT data (EPA 2018b).

Average annual GHG emissions from federal coal production, transportation, and downstream combustion shown in **Table 3-4** are 398.9 MMT $CO_2e$ and 368.2 MMT $CO_2e$ for 20-year and 100-year GWPs, respectively. These represent 6.2 and 5.7 percent of the 6,457 MMT $CO_2e$ total 2017 US GHG emissions reported by EPA (2019a). These represent 0.77 and 0.71 percent, of the 52 gigaton total 2010 global GHG emissions in $CO_2e$, as estimated by the IPCC (2014).

The average annual GHG emissions due to production, transportation, and downstream combustion of coal forecast to be produced in the BFO, using the 100-year GWP, are equivalent to the following, based on the EPA greenhouse gas equivalencies calculator (2019b):

- GHG emissions from 95 coal-fired power plants in 1 year
- GHG emissions avoided by 78,025 wind turbines running for 1 year

The corresponding numbers, based on the 20-year GWP, are 102 coal-fired power plants and 84,537 wind turbines.

Oil and Gas

**Table 3-5**, **Table 3-6**, and **Table 3-7** summarize GHG emissions from the production and downstream combustion of federal oil, conventional natural gas, and CBNG, respectively. The details by pollutant ($CO_2$, $CH_4$, and $N_2O$) are shown in **Appendix C**. GHG emissions would also result from transportation of oil and gas from the planning area by pipeline, rail, or tanker truck; however, the BLM does not have readily available data on how the transport of liquid and gaseous fossil fuels are distributed among the forms of transportation (pipeline, rail, and tanker truck) or the quantity distributed to each type. This information is necessary in order to quantify emissions that would be representative of actual or reasonably foreseeable future operations.

**Table 3-5**
**GHG Emissions as CO2e from Federal Oil Production and Combustion, Based on 20-Year and 100-Year GWPs**

| Year | Federal RFD Oil Production Rate (MMBO)[1] | $CO_2e$ (Metric Tons, 20-Year GWP) | | | $CO_2e$ (Metric Tons, 100-Year GWP) | | |
|---|---|---|---|---|---|---|---|
| | | Production | Combustion | Total | Production | Combustion | Total |
| 2019 | 3.4 | 109,807 | 1,465,922 | 1,575,729 | 66,198 | 1,462,655 | 1,528,853 |
| 2020 | 3.8 | 109,749 | 1,638,383 | 1,748,132 | 65,952 | 1,634,732 | 1,700,684 |
| 2021 | 4.1 | 104,413 | 1,767,729 | 1,872,142 | 62,490 | 1,763,789 | 1,826,279 |
| 2022 | 4.7 | 103,644 | 2,026,422 | 2,130,066 | 61,698 | 2,021,905 | 2,083,603 |
| 2023 | 5.1 | 95,049 | 2,198,883 | 2,293,932 | 56,166 | 2,193,982 | 2,250,148 |
| 2024 | 5.6 | 85,245 | 2,414,460 | 2,499,705 | 49,832 | 2,409,078 | 2,458,910 |
| 2025 | 5.8 | 88,289 | 2,500,690 | 2,588,979 | 51,612 | 2,495,117 | 2,546,729 |
| 2026 | 6.3 | 95,900 | 2,716,267 | 2,812,167 | 56,062 | 2,710,213 | 2,766,275 |
| 2027 | 6.3 | 95,900 | 2,716,267 | 2,812,167 | 56,062 | 2,710,213 | 2,766,275 |

| Year | Federal RFD Oil Production Rate (MMBO)[1] | $CO_2e$ (Metric Tons, 20-Year GWP) | | | $CO_2e$ (Metric Tons, 100-Year GWP) | | |
|---|---|---|---|---|---|---|---|
| | | Production | Combustion | Total | Production | Combustion | Total |
| 2028 | 6.7 | 101,989 | 2,888,729 | 2,990,718 | 59,621 | 2,882,290 | 2,941,911 |
| 2029 | 6.7 | 101,989 | 2,888,729 | 2,990,718 | 59,621 | 2,882,290 | 2,941,911 |
| 2030 | 6.7 | 101,989 | 2,888,729 | 2,990,718 | 59,621 | 2,882,290 | 2,941,911 |
| 2031 | 6.7 | 101,989 | 2,888,729 | 2,990,718 | 59,621 | 2,882,290 | 2,941,911 |
| 2032 | 6.7 | 101,989 | 2,888,729 | 2,990,718 | 59,621 | 2,882,290 | 2,941,911 |
| 2033 | 6.7 | 101,989 | 2,888,729 | 2,990,718 | 59,621 | 2,882,290 | 2,941,911 |
| 2034 | 6.7 | 101,989 | 2,888,729 | 2,990,718 | 59,621 | 2,882,290 | 2,941,911 |
| 2035 | 6.7 | 101,989 | 2,888,729 | 2,990,718 | 59,621 | 2,882,290 | 2,941,911 |
| 2036 | 6.7 | 101,989 | 2,888,729 | 2,990,718 | 59,621 | 2,882,290 | 2,941,911 |
| 2037 | 6.7 | 101,989 | 2,888,729 | 2,990,718 | 59,621 | 2,882,290 | 2,941,911 |
| 2038 | 6.7 | 101,989 | 2,888,729 | 2,990,718 | 59,621 | 2,882,290 | 2,941,911 |
| **Total** | **118.8** | **2,009,879** | 51,221,038 | 53,230,913 | **1,181,903** | 51,106,876 | 52,288,779 |
| **Average** | **5.9** | **100,494** | 2,561,052 | 2,661,546 | **59,095** | 2,555,344 | 2,614,439 |

Source: Ramboll 2019

[1] MMBO=million barrels

## Table 3-6
## GHG Emissions as CO2e from Federal Conventional Natural Gas Production and Combustion, Based on 20-Year and 100-Year GWPs

| Year | Federal RFD Natural Gas Production (BCF)[1] | $CO_2e$ (Metric Tons, 20-Year GWP) | | | $CO_2e$ (Metric Tons, 100-Year GWP) | | |
|---|---|---|---|---|---|---|---|
| | | Production | Combustion | Total | Production | Combustion | Total |
| 2019 | 40.8 | 211,226 | 141,039 | 352,266 | 104,430 | 140,891 | 245,321 |
| 2020 | 47.0 | 220,782 | 162,472 | 383,253 | 109,127 | 162,300 | 271,427 |
| 2021 | 54.5 | 229,872 | 188,398 | 418,271 | 113,585 | 188,199 | 301,785 |
| 2022 | 62.9 | 235,133 | 217,436 | 452,569 | 116,140 | 217,206 | 333,346 |
| 2023 | 70.3 | 229,077 | 243,016 | 472,094 | 113,092 | 242,760 | 355,851 |
| 2024 | 77.0 | 213,977 | 552,815 | 766,793 | 105,566 | 552,232 | 657,798 |
| 2025 | 80.8 | 224,537 | 580,097 | 804,634 | 110,775 | 579,485 | 690,260 |
| 2026 | 83.5 | 232,040 | 599,482 | 831,522 | 114,477 | 598,849 | 713,326 |
| 2027 | 82.7 | 229,817 | 593,738 | 823,555 | 113,380 | 593,111 | 706,492 |
| 2028 | 79.6 | 221,203 | 571,482 | 792,684 | 109,130 | 570,879 | 680,009 |
| 2029 | 79.6 | 221,203 | 571,482 | 792,684 | 109,130 | 570,879 | 680,009 |
| 2030 | 79.6 | 221,203 | 571,482 | 792,684 | 109,130 | 570,879 | 680,009 |
| 2031 | 79.6 | 221,203 | 571,482 | 792,684 | 109,130 | 570,879 | 680,009 |
| 2032 | 79.6 | 221,203 | 571,482 | 792,684 | 109,130 | 570,879 | 680,009 |
| 2033 | 79.6 | 221,203 | 571,482 | 792,684 | 109,130 | 570,879 | 680,009 |
| 2034 | 79.6 | 221,203 | 571,482 | 792,684 | 109,130 | 570,879 | 680,009 |
| 2035 | 79.6 | 221,203 | 571,482 | 792,684 | 109,130 | 570,879 | 680,009 |
| 2036 | 79.6 | 221,203 | 571,482 | 792,684 | 109,130 | 570,879 | 680,009 |
| 2037 | 79.6 | 221,203 | 571,482 | 792,684 | 109,130 | 570,879 | 680,009 |
| 2038 | 79.6 | 221,203 | 571,482 | 792,684 | 109,130 | 570,879 | 680,009 |

| Year | Federal RFD Natural Gas Production (BCF)[1] | $CO_2$e (Metric Tons, 20-Year GWP) | | | $CO_2$e (Metric Tons, 100-Year GWP) | | |
|---|---|---|---|---|---|---|---|
| | | Production | Combustion | Total | Production | Combustion | Total |
| **Total** | **1,475.1** | **4,459,691** | 9,564,794 | 14,024,486 | **2,201,004** | 9,554,699 | 11,755,703 |
| **Average** | **73.8** | **222,985** | 478,240 | 701,224 | **110,050** | 477,735 | 587,785 |

Source: Ramboll 2019

[1] BCF=billion cubic feet; production volumes are for total of conventional natural gas and CBNG production.

### Table 3-7
### GHG Emissions as $CO_2$e from Federal Coalbed Natural Gas Production and Combustion, Based on 20-Year And 100-Year GWPs

| Year | Federal RFD Natural Gas Production (BCF)[1] | $CO_2$e (Metric Tons, 20-Year GWP) | | | $CO_2$e (Metric Tons, 100-Year GWP) | | |
|---|---|---|---|---|---|---|---|
| | | Production | Combustion | Total | Production | Combustion | Total |
| 2019 | 40.8 | 1,000,964 | 2,084,720 | 3,085,684 | 343,580 | 2,082,519 | 2,426,099 |
| 2020 | 47.0 | 964,722 | 2,401,515 | 3,366,237 | 331,349 | 2,398,981 | 2,730,330 |
| 2021 | 54.5 | 900,262 | 2,784,736 | 3,684,998 | 309,499 | 2,781,797 | 3,091,296 |
| 2022 | 62.9 | 786,951 | 3,213,943 | 4,000,894 | 270,960 | 3,210,551 | 3,481,510 |
| 2023 | 70.3 | 597,811 | 3,592,054 | 4,189,865 | 206,449 | 3,588,262 | 3,794,712 |
| 2024 | 77.0 | 346,214 | 3,647,759 | 3,993,974 | 120,550 | 3,643,909 | 3,764,460 |
| 2025 | 80.8 | 363,300 | 3,827,779 | 4,191,079 | 126,500 | 3,823,739 | 3,950,238 |
| 2026 | 83.5 | 375,440 | 3,955,687 | 4,331,127 | 130,727 | 3,951,512 | 4,082,239 |
| 2027 | 82.7 | 371,843 | 3,917,788 | 4,289,632 | 129,474 | 3,913,653 | 4,043,127 |
| 2028 | 79.6 | 357,905 | 3,770,931 | 4,128,835 | 124,621 | 3,766,950 | 3,891,571 |
| 2029 | 79.6 | 357,905 | 3,770,931 | 4,128,835 | 124,621 | 3,766,950 | 3,891,571 |
| 2030 | 79.6 | 357,905 | 3,770,931 | 4,128,835 | 124,621 | 3,766,950 | 3,891,571 |
| 2031 | 79.6 | 357,905 | 3,770,931 | 4,128,835 | 124,621 | 3,766,950 | 3,891,571 |
| 2032 | 79.6 | 357,905 | 3,770,931 | 4,128,835 | 124,621 | 3,766,950 | 3,891,571 |
| 2033 | 79.6 | 357,905 | 3,770,931 | 4,128,835 | 124,621 | 3,766,950 | 3,891,571 |
| 2034 | 79.6 | 357,905 | 3,770,931 | 4,128,835 | 124,621 | 3,766,950 | 3,891,571 |
| 2035 | 79.6 | 357,905 | 3,770,931 | 4,128,835 | 124,621 | 3,766,950 | 3,891,571 |
| 2036 | 79.6 | 357,905 | 3,770,931 | 4,128,835 | 124,621 | 3,766,950 | 3,891,571 |
| 2037 | 79.6 | 357,905 | 3,770,931 | 4,128,835 | 124,621 | 3,766,950 | 3,891,571 |
| 2038 | 79.6 | 357,905 | 3,770,931 | 4,128,835 | 124,621 | 3,766,950 | 3,891,571 |
| **Total** | **1,475.1** | **9,644,460** | **70,906,218** | **80,550,677** | **3,339,917** | **70,831,377** | **74,171,294** |
| **Average** | **73.8** | **482,223** | **3,545,311** | **4,027,534** | **166,996** | **3,541,569** | **3,708,565** |

Source: Ramboll 2019

[1] BCF=billion cubic feet; production volumes are for total of conventional natural gas and CBNG production.

The GHG emissions attributable to the transport of oil and gas produced from the planning area would occur in the form of $CO_2$, $CH_4$, and $N_2O$. GHG emissions attributable to the end use of the produced liquid and gaseous fossil fuels have been estimated by assuming that 100 percent is combusted for heat or energy production. Although the actual end use of these products may also include transportation fuels, stock for plastics, chemical, and synthetic materials production, or other manufacturing, it is reasonably foreseeable to estimate emissions from combustion.

As in the case of coal production, the GHG emissions discussed above due to oil and gas production and downstream combustion would contribute incrementally to global climate change, although at a much lower level, relative to the coal production, transportation, and downstream combustion. As noted previously, the lack of precise scientific tools (models with sufficient spatial and temporal resolution) to forecast climate change at local scales limits the ability to accurately quantify the future impacts on climate change in the planning area. Furthermore, potential impacts on climate change are influenced by GHG emission sources from around the world, and it is not possible to accurately distinguish the impacts on global climate change from GHG emissions originating just from the planning area; instead, the GHG emissions due to the federal action are compared with state, national, and global GHG emissions, along with other metrics.

Total GHG emissions from federal oil production and downstream combustion shown in **Table 3-5** over the 20-year RMP lifetime, based on 20-year and 100-year GWPs, are 53.2 MMT $CO_2e$ and 52.3 MMT $CO_2e$, respectively. Downstream combustion contributes 51.2 MMT $CO_2e$ and 51.1 MMT $CO_2e$.

Average annual GHG emissions from the production and downstream combustion of federal oil produced in the BFO (shown in **Table 3-5**) are 2.7 metric tons $CO_2e$ and 2.6 metric tons $CO_2e$ using 20-year and 100-year GWPs, respectively. These represent 4.5 and 4.3 percent of the 60.4 MMT $CO_2e$ total 2017 Wyoming GHG emissions for major facilities as reported in the EPA FLIGHT data (EPA 2018b).

Average annual GHG emissions from the production and downstream combustion of federal oil in the BFO represent 0.042 and 0.040 percent, respectively, of the 6,457 MMT $CO_2e$ total 2017 US GHG emissions reported by EPA (EPA 2019a) and 0.0052 and 0.0050 percent, respectively, of the 52 gigatonnes total 2010 global GHG emissions in $CO_2e$ estimated by IPCC (IPCC 2014).

The average annual GHG emissions reported above using the 100-year GWP are equivalent to the following, based on the EPA greenhouse gas equivalencies calculator (2019b):

- 0.672 coal-fired power plant GHG emissions in 1 year (or emissions from one power plant for 245 days),
- GHG emissions avoided by 554 wind turbines running for 1 year

The corresponding numbers based on the 20-year GWP are 0.684 coal-fired power plant GHG emissions and 564 wind turbines.

Total GHG emissions from federal natural gas production and downstream combustion (total of conventional natural gas and CBNG production and combustion) shown in **Table 3-6** and **Table 3-7** over the 20-year SEIS/RMPA lifetime, based on 20-year and 100-year GWPs, are 94.6 MMT $CO_2e$ and 85.9 MMT $CO_2e$. Downstream combustion represents 80.5 MMT $CO_2e$ and 80.4 MMT $CO_2e$.

The average annual GHG emissions from federal natural gas production and downstream combustion (total of conventional natural gas and CBNG production and combustion) shown in **Table 3-6** and **Table 3-7** are 4.7 MMT $CO_2e$ and 4.3 MMT $CO_2e$ using 20-year and 100-year GWPs, respectively. These represent 7.8 and 7.1 percent of the 60.4 MMT $CO_2e$ total 2017 Wyoming GHG emissions for major facilities, as reported in the EPA FLIGHT data (2018b). When compared with US GHG emissions, these values represent 0.073 and 0.067 percent, respectively, of the 6,457 MMT $CO_2e$ total 2017 US GHG emissions reported by EPA (2019a). When compared with global GHG emissions, these values represent 0.009 and 0.008 percent, respectively, of the 52 gigatonnes total 2010 global GHG emissions in $CO_2e$ estimated by IPCC (2014).

When GHG emissions from federal oil and gas developed in the BFO are combined (totals from **Table 3-5, Table 3-6** and **Table 3-7**), the average annual GHG emissions are 7.4 MMT $CO_2e$ and 6.9 MMT $CO_2e$ using 20-year and 100-year GWPs, respectively. These represent 12.2 and 11.4 percent of the 60.4 MMT $CO_2e$ total 2017 Wyoming GHG emissions for major facilities, as reported in the EPA FLIGHT data (2018b). When compared with US GHG emissions, these values represent 0.115 and 0.107 percent, respectively, of the 6,457 MMT $CO_2e$ total 2017 US GHG emissions reported by EPA (2019a). When compared with global GHG emissions, these values represent 0.0142 and 0.0133 percent, respectively, of the 52 gigaton total 2010 global GHG emissions in $CO_2e$ estimated by the IPCC (2014).

The average annual GHG emissions estimated above for federal oil and gas developed in the BFO, using the 100-year GWP, are equivalent to the following, based on the EPA greenhouse gas equivalencies calculator (2019b):

- 1.8 coal-fired power plant GHG emissions in 1 year
- GHG emissions avoided by 1,462 wind turbines running for 1 year

The corresponding numbers based on the 20-year GWP are 1.9 coal-fired power plants and 1,568 wind turbines.

The Buffalo Field Office Proposed RMP/Final EIS discussed climate change in relation to potential threats to factors contributing to human health. In addition, the US Global Change Research Program (USGCRP) conducted an extensive Climate and Health Assessment to increase the understanding of the various ways climate change may pose a threat to human health (USGCRP 2016). This assessment builds on the Third National Climate Assessment, and some of its findings include the following:

- Average temperatures have been rising and extreme temperatures (hot and cold) have intensified in many parts of the country. Days that are hotter than the average seasonal temperature in the summer or colder than the average seasonal temperature in the winter can cause increased levels of illness and death by compromising the body’s ability to regulate its temperature or by inducing direct or indirect health complications.
- Climate change has the potential to harm human health through exposure to degraded air quality.
- Some American populations could be disproportionately vulnerable to climate change, including those with low income, some communities of color and immigrant groups, children and pregnant women, older adults, vulnerable occupational groups, persons with disabilities, and persons with preexisting or chronic medical conditions.
- Some regions of the United States have already observed changes in the frequency, intensity, or duration of certain extreme events, and projections from climate models show that the occurrence and severity of these events could continue to increase with climate change. Extreme weather events are known to have health impacts such as death or injury during an event (for example, drowning during floods). In addition, before or after an extreme event individuals may be involved in activities that put their health at risk (e.g., disaster preparation and post-event cleanup) or may be unable to get sufficient water, food, or medical care following an extreme event. Health risks may also arise long after the event, or in places outside the area where the event took place, as a result of damage to property, destruction of assets, loss of infrastructure and public services, social and economic impacts, environmental degradation, and other factors.

### *Cumulative Impacts*

Cumulative impacts are evaluated from the total production of federal and nonfederal coal, oil, and gas in the planning area, as well as other past, present, and reasonably foreseeable sources of reportable GHG emissions. GHG emissions from the production, transportation, and downstream combustion of coal forecast to be produced on nonfederal lands in the planning area are evaluated following methods similar to those described above using EIA 2019 nonfederal coal production forecasts for the plan period. GHG emissions from the production and downstream combustion of oil and gas forecast to be developed from non-federal minerals in the planning area (see the 2015 Proposed RMP/Final EIS; BLM 2015) are assessed using methods similar to those described for federal oil and gas above. GWP values for both 20- and 100-year time horizons are used (see **Table 3-2**).

Direct and indirect emissions from nonfederal coal, oil, and gas are combined with direct and indirect emissions from federal coal, oil, and gas, as described above. These emissions totals are also combined with emissions from large sources other than coal mining and oil and gas development and production in the planning area for the most recent (2017) EPA FLIGHT data.

**Table 3-8** reports the cumulative effects in terms of GHG emissions from the sources listed above. These include GHG emissions in the planning area, including federal and non-federal coal and oil and gas and other major sources, as well as downstream combustion emissions outside the area, resulting from coal and oil and gas developed in the area.

**Table 3-8**
**Production and GHG emissions as $CO_2e$ (Average Over Planning Period) from Cumulative Sources, Based on 20-Year and 100-Year GWPs**

| Production | GHG Emissions | GHG Emissions in $CO_2e$ (MMT/Year) | |
|---|---|---|---|
| | | 20-year GWP | 100-year GWP |
| Federal coal production<br>213.0 MMst/yr | GHG emissions from federal coal production | 15.7 | 5.2 |
| | GHG emissions from federal coal transportation | 3.3 | 3.3 |
| | GHG emissions from federal coal combustion | 361.9 | 359.7 |
| Non-federal coal production<br>31.0 MMst/yr | GHG emissions from non-federal coal production | 2.3 | 0.7 |
| | GHG emissions from non-federal coal transportation | 0.5 | 0.5 |
| | GHG emissions from non-federal coal combustion | 52.6 | 52.3 |
| Federal oil production<br>5.9 MMBO/yr | GHG emissions from federal oil production | 0.1 | 0.06 |
| | GHG emissions from federal oil combustion | 2.6 | 2.6 |
| Federal production of conventional and coalbed natural gas<br>73.8 BCF/yr | GHG emissions from federal gas production | 0.7 | 0.3 |
| | GHG emissions from federal gas combustion | 4.0 | 4.0 |
| Non-federal oil production<br>6.3 MMBO/yr | GHG emissions from non-federal oil production | 0.10 | 0.06 |
| | GHG emissions from non-federal oil combustion | 2.7 | 2.7 |
| Non-federal production of conventional and coalbed natural gas<br>124.7 BCF/yr | GHG emissions from non-federal gas production | 1.3 | 0.5 |
| | GHG emissions from non-federal gas combustion | 6.8 | 6.8 |
| Other cumulative GHG emission sources | GHG emissions from other major sources in 2017 in planning area from FLIGHT (EPA 2018b)* | 10.2 | 10.1 |

| Production | GHG Emissions | GHG Emissions in $CO_2$e (MMT/Year) | |
|---|---|---|---|
| | | 20-year GWP | 100-year GWP |
| **Cumulative GHG emissions in $CO_2$e (annual average over plan period)** | - | **464.8** | **448.6** |

Source: Ramboll 2019
All numbers shown are annual average over planning period except for FLIGHT data.
MMst=million short tons; MMT=million metric tons; MMBO-million barrels of oil; BCF=billion cubic feet
Cumulative totals may not add up due to rounding.
*FLIGHT facility emissions include emissions from power plants in the planning area, which are included in the downstream combustion of coal category; therefore, the cumulative GHG emissions shown in the next row are an over-estimate

### *Summary*

GHG emissions from the production and downstream combustion of coal, oil, and conventional and coal bed natural gas under the SEIS/RMPA were calculated using 100-year and 20-year GWPs. This was done to represent GHG impacts over the longer-term 100-year timespan used in the EPA's national GHG inventory and the shorter 20-year life of the RMP for comparison. GHG emissions from coal transportation were also quantified. GWP values selected for this analysis represent the most current widely recognized and widely used estimates in the climate science community. Differences in $CO_2$e emissions between the two time horizons mostly reflect the short atmospheric lifetime of methane, relative to carbon dioxide and nitrous oxide. As a result, the differences are largest for such sources as coal production with relatively large ratios of methane-to-carbon dioxide emissions.

Coal, oil, and gas production and therefore GHG emissions are the same under Alternative A (the No Action Alternative) and Alternative B (the action alternative). Average annual GHG emissions over the RMP plan period for coal, oil, and gas are compared for federal and nonfederal resources and with other cumulative sources in **Table 3-9**. Cumulative annual average emissions (total $CO_2$e) are 464.8 MMT/year and 448.6 MMT/year, using the 20-year and 100-year time horizon GWPs, respectively. These values represent 6.9 percent and 0.9 percent of the total 2017 national and 2010 global annual $CO_2$e emissions,[4] respectively. These were based on the 100-year time horizon values and will contribute to the climate change impacts described under *Affected Environment*, above.

**Table 3-9**
**Summary of Annual Average GHG Emissions from Coal, Oil, and Gas Production, Transport, and Downstream Combustion Over the 20-Year Life of the SEIS/RMPA RFD**

| Annual Average GHG Emissions | $CO_2$e MMT/Year (20-Year GWPs) | $CO_2$e MMT/Year (100-Year GWPs) |
|---|---|---|
| Federal action total | 388.3 | 375.0 |
| Nonfederal total | 66.3 | 63.5 |
| Other cumulative sources within the planning area | 10.2 | 10.1 |
| **Total (annual average over life of the SEIS/RMPA)*** | **464.8** | **448.6** |

Source: Ramboll 2019
* Numbers may not add exactly to the total due to rounding

Over the 20-year life of the plan, SEIS/RMPA sources will release 9,296 and 8,972 MMT $CO_2$e for 20-year and 100-year time horizon GWPs, respectively. Approximately 14 percent of emissions from the RFD are associated with nonfederal resources. Other cumulative sources in the planning area contribute just over 2 percent of total emissions.

---

[4] 2010 is the year of the most recent global GHG emissions inventory shown in the IPCC Fifth Assessment (IPCC 2014).

Downstream combustion is the dominant source of GHGs for coal and gas: combustion $CO_2e$ emissions account for 95 percent and 98 percent of the RFD (action) emissions shown in **Table 3-9** for 20-year and 100-year GWPs, respectively. By 2038, global GHG emissions are estimated to be between approximately 30 and 80 gigatonnes $CO_2e$ annually under the IPCC lower bound and higher bound representative concentration pathways (RCP 2.6 and RCP 8.5), respectively (IPCC 2014). Cumulative annual average emissions over the plan period thus represent between 1.5 percent and 0.6 percent of the global emissions. This would be the case under different future global representative concentration scenarios and would contribute, in part, to the climate change impacts described under *Affected Environment*, above.

# Appendix C

## ERRATA Air Resources Technical Support Report

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# Appendix C. Air Resources Technical Support Report

This appendix provides additional details on the greenhouse gas (GHG) emission estimates completed for the air resources analysis (see Chapter 3 of the SEIS/RMPA for the Buffalo Field Office. **Tables 3-4** through **3-7** in **Section 3.5.1** of the SEIS/RMPA summarize total GHG emissions in units of carbon dioxide equivalents ($CO_2e$) from federal coal, oil, natural gas, and coal bed natural gas. This appendix details GHG emissions by pollutant.

**Tables C-1** through **C-4** show the GHG emissions for carbon dioxide ($CO_2$), methane ($CH_4$), and nitrous oxide ($N_2O$), the primary compounds that contribute to GHG emissions in the Buffalo Field Office. **Table C-1** presents the $CO_2$, $CH_4$, and $N_2O$ emissions from federal coal production, transportation, downstream combustion and compound totals, while **Table C-2**, **Table C-3**, and **Table C-4** present the $CO_2$, $CH_4$, and $N_2O$ emissions from oil and gas production and downstream combustion processes. Oil and gas transportation emissions are discussed qualitatively in **Section 3.5.1** of the SEIS/RMPA. The emission factors and methods used in the calculations are discussed in **Section 3.5.1**; the data are available in the administrative record for the SEIS/RMPA.

## Table C-1
## $CO_2$, $CH_4$, and $N_2O$ emissions from Federal Coal Production, Transportation, and Combustion

| Year | Federal RFD Coal Production Rate (MMst)[1] | $CO_2$ (MMT)[2] | | | | $CH_4$ (MMT)[2] | | | | $N_2O$ (MMT)[2] | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Prod | Trans | Comb | Total | Prod | Trans | Comb | Total | Prod | Trans | Comb | Total |
| 2019 | 258.6 | NE | 3.9 | 433.5 | 437.4 | 0.23 | 0.000 | 0.05 | 0.28 | NE | 0.00011 | 0.007 | 0.01 |
| 2020 | 225.8 | NE | 3.4 | 378.4 | 381.8 | 0.20 | 0.000 | 0.04 | 0.24 | NE | 0.00010 | 0.006 | 0.01 |
| 2021 | 217.7 | NE | 3.3 | 364.9 | 368.2 | 0.19 | 0.000 | 0.04 | 0.23 | NE | 0.00009 | 0.006 | 0.01 |
| 2022 | 204.7 | NE | 3.1 | 343.1 | 346.2 | 0.18 | 0.000 | 0.04 | 0.22 | NE | 0.00009 | 0.006 | 0.01 |
| 2023 | 201.2 | NE | 3.1 | 337.2 | 340.2 | 0.18 | 0.000 | 0.04 | 0.22 | NE | 0.00009 | 0.006 | 0.01 |
| 2024 | 204.4 | NE | 3.1 | 342.6 | 345.7 | 0.18 | 0.000 | 0.04 | 0.22 | NE | 0.00009 | 0.006 | 0.01 |
| 2025 | 204.7 | NE | 3.1 | 343.2 | 346.3 | 0.18 | 0.000 | 0.04 | 0.22 | NE | 0.00009 | 0.006 | 0.01 |
| 2026 | 208.1 | NE | 3.2 | 348.8 | 352.0 | 0.18 | 0.000 | 0.04 | 0.22 | NE | 0.00009 | 0.006 | 0.01 |
| 2027 | 204.1 | NE | 3.1 | 342.1 | 345.2 | 0.18 | 0.000 | 0.04 | 0.22 | NE | 0.00009 | 0.006 | 0.01 |
| 2028 | 203.4 | NE | 3.1 | 340.9 | 344.0 | 0.18 | 0.000 | 0.04 | 0.22 | NE | 0.00009 | 0.006 | 0.01 |
| 2029 | 213.4 | NE | 3.2 | 357.6 | 360.9 | 0.19 | 0.000 | 0.04 | 0.23 | NE | 0.00009 | 0.006 | 0.01 |
| 2030 | 221 | NE | 3.4 | 370.3 | 373.7 | 0.19 | 0.000 | 0.04 | 0.24 | NE | 0.00010 | 0.006 | 0.01 |
| 2031 | 218 | NE | 3.3 | 365.3 | 368.6 | 0.19 | 0.000 | 0.04 | 0.23 | NE | 0.00009 | 0.006 | 0.01 |
| 2032 | 214.3 | NE | 3.3 | 359.2 | 362.5 | 0.19 | 0.000 | 0.04 | 0.23 | NE | 0.00009 | 0.006 | 0.01 |
| 2033 | 211.8 | NE | 3.2 | 354.9 | 358.1 | 0.19 | 0.000 | 0.04 | 0.23 | NE | 0.00009 | 0.006 | 0.01 |
| 2034 | 211.5 | NE | 3.2 | 354.5 | 357.7 | 0.19 | 0.000 | 0.04 | 0.23 | NE | 0.00009 | 0.006 | 0.01 |
| 2035 | 209.9 | NE | 3.2 | 351.9 | 355.1 | 0.18 | 0.000 | 0.04 | 0.22 | NE | 0.00009 | 0.006 | 0.01 |
| 2036 | 210.3 | NE | 3.2 | 352.5 | 355.6 | 0.19 | 0.000 | 0.04 | 0.23 | NE | 0.00009 | 0.006 | 0.01 |
| 2037 | 208.9 | NE | 3.2 | 350.1 | 353.2 | 0.18 | 0.000 | 0.04 | 0.22 | NE | 0.00009 | 0.006 | 0.01 |
| 2038 | 207.7 | NE | 3.1 | 348.0 | 351.2 | 0.18 | 0.000 | 0.04 | 0.22 | NE | 0.00009 | 0.006 | 0.01 |

[1] MMst: million short tons

[2] Prod=production, Trans=transportation, Comb=combustion. Note coal production emissions for $CO_2$ and $N_2O$ were not included in the 2015 Proposed RMP/Final EIS.

NE = Not estimated. This is because these values were not calculated in the 2015 Proposed RMP/Final EIS. They will be small, compared with the combustion values.

## Table C-2
## $CO_2$, $CH_4$, and $N_2O$ Emissions from Federal Oil Production and Combustion

| Year | Federal RFD Oil Production Rate (MMBO)[1] | $CO_2$ (Metric Tons)[2] | | | $CH_4$ (Metric Tons)[2] | | | $N_2O$ (Metric Tons)[2] | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Prod | Comb | Total | Prod | Comb | Total | Prod | Comb | Total |
| 2019 | 3.4 | 44,044 | 1,457,988 | 1,502,032 | 779 | 59 | 837 | 1 | 11 | 13 |
| 2020 | 3.8 | 43,706 | 1,629,516 | 1,673,222 | 782 | 65 | 848 | 1 | 13 | 14 |
| 2021 | 4.1 | 41,201 | 1,758,162 | 1,799,363 | 749 | 71 | 819 | 1 | 14 | 15 |
| 2022 | 4.7 | 40,403 | 2,015,454 | 2,055,857 | 749 | 81 | 830 | 1 | 16 | 17 |
| 2023 | 5.1 | 36,434 | 2,186,982 | 2,223,416 | 694 | 88 | 782 | 1 | 17 | 18 |
| 2024 | 5.6 | 31,871 | 2,401,392 | 2,433,263 | 632 | 96 | 729 | 1 | 19 | 20 |
| 2025 | 5.8 | 33,009 | 2,487,156 | 2,520,165 | 655 | 100 | 755 | 1 | 19 | 20 |
| 2026 | 6.3 | 35,855 | 2,701,566 | 2,737,421 | 711 | 108 | 820 | 1 | 21 | 22 |
| 2027 | 6.3 | 35,855 | 2,701,566 | 2,737,421 | 711 | 108 | 820 | 1 | 21 | 22 |
| 2028 | 6.7 | 38,131 | 2,873,094 | 2,911,225 | 757 | 115 | 872 | 1 | 23 | 24 |
| 2029 | 6.7 | 38,131 | 2,873,094 | 2,911,225 | 757 | 115 | 872 | 1 | 23 | 24 |
| 2030 | 6.7 | 38,131 | 2,873,094 | 2,911,225 | 757 | 115 | 872 | 1 | 23 | 24 |
| 2031 | 6.7 | 38,131 | 2,873,094 | 2,911,225 | 757 | 115 | 872 | 1 | 23 | 24 |
| 2032 | 6.7 | 38,131 | 2,873,094 | 2,911,225 | 757 | 115 | 872 | 1 | 23 | 24 |
| 2033 | 6.7 | 38,131 | 2,873,094 | 2,911,225 | 757 | 115 | 872 | 1 | 23 | 24 |
| 2034 | 6.7 | 38,131 | 2,873,094 | 2,911,225 | 757 | 115 | 872 | 1 | 23 | 24 |
| 2035 | 6.7 | 38,131 | 2,873,094 | 2,911,225 | 757 | 115 | 872 | 1 | 23 | 24 |
| 2036 | 6.7 | 38,131 | 2,873,094 | 2,911,225 | 757 | 115 | 872 | 1 | 23 | 24 |
| 2037 | 6.7 | 38,131 | 2,873,094 | 2,911,225 | 757 | 115 | 872 | 1 | 23 | 24 |
| 2038 | 6.7 | 38,131 | 2,873,094 | 2,911,225 | 757 | 115 | 872 | 1 | 23 | 24 |

[1] MMBO=million barrels of oil

[2] Prod=production; Comb=combustion

## Table C-3

## $CO_2$, $CH_4$, and $N_2O$ Emissions from Federal Natural Gas Production and Combustion

| Year | $CO_2$ (metric tons)[1] | | | $CH_4$ (metric tons)[1] | | | $N_2O$ (metric tons)[1] | | |
|---|---|---|---|---|---|---|---|---|---|
| | Prod | Comb | Total | Prod | Comb | Total | Prod | Comb | Total |
| 2019 | 50,910 | 140,747 | 191,657 | 1,907 | 3 | 1,910 | 0.5 | 0.3 | 0.7 |
| 2020 | 53,172 | 162,136 | 215,307 | 1,994 | 3 | 1,997 | 0.5 | 0.3 | 0.8 |
| 2021 | 55,309 | 188,008 | 243,317 | 2,077 | 4 | 2,080 | 0.5 | 0.3 | 0.8 |
| 2022 | 56,507 | 216,986 | 273,493 | 2,125 | 4 | 2,129 | 0.5 | 0.4 | 0.9 |
| 2023 | 54,967 | 242,513 | 297,480 | 2,071 | 5 | 2,076 | 0.5 | 0.4 | 0.9 |
| 2024 | 51,237 | 551,671 | 602,908 | 1,936 | 10 | 1,946 | 0.5 | 1.0 | 1.5 |
| 2025 | 53,765 | 578,896 | 632,662 | 2,031 | 11 | 2,042 | 0.5 | 1.1 | 1.5 |
| 2026 | 55,562 | 598,241 | 653,803 | 2,099 | 11 | 2,111 | 0.5 | 1.1 | 1.6 |
| 2027 | 55,030 | 592,509 | 647,539 | 2,079 | 11 | 2,090 | 0.5 | 1.1 | 1.6 |
| 2028 | 52,967 | 570,299 | 623,266 | 2,001 | 11 | 2,012 | 0.5 | 1.0 | 1.5 |
| 2029 | 52,967 | 570,299 | 623,266 | 2,001 | 11 | 2,012 | 0.5 | 1.0 | 1.5 |
| 2030 | 52,967 | 570,299 | 623,266 | 2,001 | 11 | 2,012 | 0.5 | 1.0 | 1.5 |
| 2031 | 52,967 | 570,299 | 623,266 | 2,001 | 11 | 2,012 | 0.5 | 1.0 | 1.5 |
| 2032 | 52,967 | 570,299 | 623,266 | 2,001 | 11 | 2,012 | 0.5 | 1.0 | 1.5 |
| 2033 | 52,967 | 570,299 | 623,266 | 2,001 | 11 | 2,012 | 0.5 | 1.0 | 1.5 |
| 2034 | 52,967 | 570,299 | 623,266 | 2,001 | 11 | 2,012 | 0.5 | 1.0 | 1.5 |
| 2035 | 52,967 | 570,299 | 623,266 | 2,001 | 11 | 2,012 | 0.5 | 1.0 | 1.5 |
| 2036 | 52,967 | 570,299 | 623,266 | 2,001 | 11 | 2,012 | 0.5 | 1.0 | 1.5 |
| 2037 | 52,967 | 570,299 | 623,266 | 2,001 | 11 | 2,012 | 0.5 | 1.0 | 1.5 |
| 2038 | 52,967 | 570,299 | 623,266 | 2,001 | 11 | 2,012 | 0.5 | 1.0 | 1.5 |

[1] Prod=production; Comb=combustion

## Table C-4
## CO2, CH4, and N2O Emissions from Federal Coalbed Natural Gas Production and Combustion

| Year | $CO_2$ (metric tons) [1] | | | $CH_4$ (metric tons) [1] | | | $N_2O$ (metric tons) [1] | | |
|---|---|---|---|---|---|---|---|---|---|
| | Prod | Comb | Total | Prod | Comb | Total | Prod | Comb | Total |
| 2019 | 14,860 | 2,080,405 | 2,095,264 | 11,739 | 39 | 11,778 | 0.1 | 3.8 | 3.9 |
| 2020 | 14,635 | 2,396,544 | 2,411,179 | 11,310 | 45 | 11,356 | 0.1 | 4.4 | 4.5 |
| 2021 | 14,091 | 2,778,972 | 2,793,063 | 10,549 | 53 | 10,602 | 0.1 | 5.1 | 5.2 |
| 2022 | 12,939 | 3,207,290 | 3,220,230 | 9,214 | 61 | 9,275 | 0.1 | 5.9 | 6.0 |
| 2023 | 10,748 | 3,584,619 | 3,595,366 | 6,989 | 68 | 7,056 | 0.1 | 6.6 | 6.7 |
| 2024 | 7,704 | 3,640,209 | 3,647,913 | 4,030 | 69 | 4,099 | 0.1 | 6.7 | 6.7 |
| 2025 | 8,084 | 3,819,856 | 3,827,940 | 4,229 | 72 | 4,301 | 0.1 | 7.0 | 7.1 |
| 2026 | 8,354 | 3,947,499 | 3,955,853 | 4,370 | 75 | 4,445 | 0.1 | 7.3 | 7.3 |
| 2027 | 8,274 | 3,909,679 | 3,917,953 | 4,328 | 74 | 4,402 | 0.1 | 7.2 | 7.2 |
| 2028 | 7,964 | 3,763,125 | 3,771,089 | 4,166 | 71 | 4,237 | 0.1 | 6.9 | 7.0 |
| 2029 | 7,964 | 3,763,125 | 3,771,089 | 4,166 | 71 | 4,237 | 0.1 | 6.9 | 7.0 |
| 2030 | 7,964 | 3,763,125 | 3,771,089 | 4,166 | 71 | 4,237 | 0.1 | 6.9 | 7.0 |
| 2031 | 7,964 | 3,763,125 | 3,771,089 | 4,166 | 71 | 4,237 | 0.1 | 6.9 | 7.0 |
| 2032 | 7,964 | 3,763,125 | 3,771,089 | 4,166 | 71 | 4,237 | 0.1 | 6.9 | 7.0 |
| 2033 | 7,964 | 3,763,125 | 3,771,089 | 4,166 | 71 | 4,237 | 0.1 | 6.9 | 7.0 |
| 2034 | 7,964 | 3,763,125 | 3,771,089 | 4,166 | 71 | 4,237 | 0.1 | 6.9 | 7.0 |
| 2035 | 7,964 | 3,763,125 | 3,771,089 | 4,166 | 71 | 4,237 | 0.1 | 6.9 | 7.0 |
| 2036 | 7,964 | 3,763,125 | 3,771,089 | 4,166 | 71 | 4,237 | 0.1 | 6.9 | 7.0 |
| 2037 | 7,964 | 3,763,125 | 3,771,089 | 4,166 | 71 | 4,237 | 0.1 | 6.9 | 7.0 |
| 2038 | 7,964 | 3,763,125 | 3,771,089 | 4,166 | 71 | 4,237 | 0.1 | 6.9 | 7.0 |

[1] Prod=production; Comb=combustion

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# ACRONYMS AND ABBREVIATIONS

| | Full Phrase |
|---|---|
| AEO | Annual Energy Outlook |
| AVBs | attitudes, values, and beliefs |
| BFO | Buffalo Field Office |
| BLM | United States Department of the Interior, Bureau of Land Management |
| BNSF | Burlington Northern Santa Fe |
| CBNG | coalbed natural gas |
| CDPA | coal development potential area |
| CEQ | Council of Environmental Quality |
| CFR | Code of Federal Regulations |
| $CH_4$ | methane |
| $CO_2$ | carbon dioxide |
| $CO_2e$ | carbon dioxide equivalent |
| DEQ | Department of Environmental Quality |
| DOI | United States Department of the Interior |
| EIA | Energy Information Agency |
| EIS | environmental impact statement |
| EPA | US Environmental Protection Agency |
| ESA | Endangered Species Act |
| FEIS | Final Environmental Impact Statement |
| FLPMA | Federal Land Policy and Management Act |
| FR | Federal Register |
| GHGs | greenhouse gases |
| GHGRP | Greenhouse Gas Reporting Program |
| GHMA | General Habitat Management Area |
| GIS | Geographic Information System |
| GWP | global warming potential |
| IPCC | Intergovernmental Panel on Climate Change |
| MMst | million short tons |
| MMT | million metric tons |
| Mtoe | million tons of oil equivalent |
| NCA | Fourth National Climate Assessment |
| NEMS | National Energy Modeling System |
| NEPA | National Environmental Policy Act |
| $N_2O$ | nitrogen oxide |
| NOI | Notice of Intent |
| NRHP | National Register of Historic Places |
| ONRR | Office of Natural Resource Revenue |

| | |
|---|---|
| PHMA | Priority Habitat Management Area |
| PRB | Powder River Basin |
| RCP | Representative Concentration Pathways |
| RFD | reasonably foreseeable development |
| RMP | Resource Management Plan |
| RMPA | Resource Management Plan Amendment |
| ROW | right-of-way |
| SEIS | supplemental environmental impact statement |
| SHPO | State Historic Preservation Office |
| USFS | US Forest Service |
| USFWS | United States Fish and Wildlife Service |
| US | United States |
| WGFD | Wyoming Game and Fish Department |

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# Executive Summary

## ES.1 INTRODUCTION

The US Department of the Interior (DOI), Bureau of Land Management (BLM) has prepared this supplemental environmental impact statement (SEIS) and potential resource management plan amendment (RMPA) for the BLM Buffalo Field Office (BFO). It was prepared in accordance with the National Environmental Policy Act of 1969 (NEPA); Council on Environmental Quality regulations for implementing NEPA (40 Code of Federal Regulations [CFR] 1500–1508); BLM NEPA regulations (43 CFR 46); the Federal Land Policy and Management Act (FLPMA) of 1976 (43 US Code [USC] 1701 et seq.); requirements of the BLM's NEPA Handbook, H-1790-1 (BLM 2008a); and the BLM's Land Use Planning Handbook, H-1601-1 (BLM 2005a).

The BLM prepared this SEIS/RMPA to respond to the US District Court for the District of Montana court order (*Western Organization of Resource Councils et al. v. BLM*). The District Court deemed inadequate the decisions related to the amount of coal available for leasing and the direct, indirect, and cumulative impacts from fossil fuel development in the 2015 Proposed RMP/Final EIS and Record of Decision (ROD). It ordered the BLM to complete a remedial NEPA analysis for the RMP. Through this SEIS/RMPA, the BLM will analyze an alternative that would decrease the amount of coal available for leasing, would consider climate change impacts of coal leasing, and would conduct new coal screening. It also would analyze the environmental consequences of downstream fossil fuel combustion,[1] including global warming potential over 20-year and 100-year time horizons.

The approved SEIS/RMPA could amend the 2015 Proposed RMP/Final EIS, as amended, concerning the coal allocation decisions. Information about the SEIS/RMPA can be obtained on the project website, https://go.usa.gov/xP6S3. The BFO completed the 2015 Proposed RMP/Final EIS in September 2015; they amended it in 2019, based on Greater Sage-Grouse management revisions. It provides management guidance and direction for approximately 800,000 acres of BLM-administered surface land and 4.7-million acres of BLM-administered mineral estate in Campbell, Johnson, and Sheridan Counties in north-central Wyoming. BLM management applies only to public lands, meaning those lands where the BLM has management responsibility for either the surface or the subsurface estate. The decision area is BLM-administered federal coal in the BFO. This is approximately 4.7 million acres of subsurface federal mineral coal estate for which the BLM has the authority to determine availability. **Figure ES-1** is a map of the decision area.

## ES.2 PURPOSE OF AND NEED FOR THE RESOURCE MANAGEMENT PLAN AMENDMENT

The purpose of this SEIS is to provide additional analysis for land use planning specifically regarding analysis for coal, oil, and gas in the BFO and to determine the lands to be made available for coal leasing. To support analysis in the SEIS/RMPA and subsequent decision-making, the BLM has conducted new coal screening, in accordance with 43 CFR 3420.1-4.

This SEIS/RMPA is needed in order to accomplish the following:

- Consider an alternative that would reduce the amount of recoverable coal and consider climate change impacts, in order to make a reasoned decision on the amount of recoverable coal made available

---

[1] Combustion of coal, oil, or gas at a location different from the place of production or development.

- Supplement the analysis of the environmental consequences of downstream combustion of coal, oil, and gas open to development
- Justify the time horizon of the estimated global warming potential impacts—that is, 20-year or 100-year—and acknowledge the evolving science in this area

## ES.3 SCOPING

The formal scoping period began with publication of the Notice of Intent (NOI) in the *Federal Register* on November 28, 2018. The BLM provided the NOI for public consideration at a public scoping meeting in Gillette, Wyoming, on December 19, 2018. The BLM posted it on the BFO SEIS/RMPA project website, https://go.usa.gov/xP6S3. The period during which the public could submit scoping comments ended December 28, 2018.

The BFO received 37 unique submissions, with 278 comments, categorized into eight issue categories. Most comments received were for resource-specific issues-coal, oil and gas, air quality and climate change and economic issues, best available information/baseline data, and the range of alternatives. Detailed information can be found in the scoping report on the BFO SEIS/RMPA ePlanning website, https://go.usa.gov/xP6S3.

The BLM engaged with federal, tribal, state, and local governments as part of this SEIS/RMPA. The BLM sent letters to eligible agencies and tribes inviting them to be cooperating agencies and to assist with the document. In the tribal letters the BLM also asked if the tribes wanted to initiate formal government-to-government consultation. The BLM held a cooperating agency meeting before the public scoping meeting, which took place on December 19, 2018.

## ES.4 ISSUES

Table 2-2 in the Buffalo Field Office Supplemental EIS and RMPA Scoping Report (BLM 2019) shows the number of comments by specific resource or resource use. Approximately 33 percent of the resources and resource use comments were related to climate change, 14 percent were related to oil and gas, and 12 percent were related to the social cost of carbon.

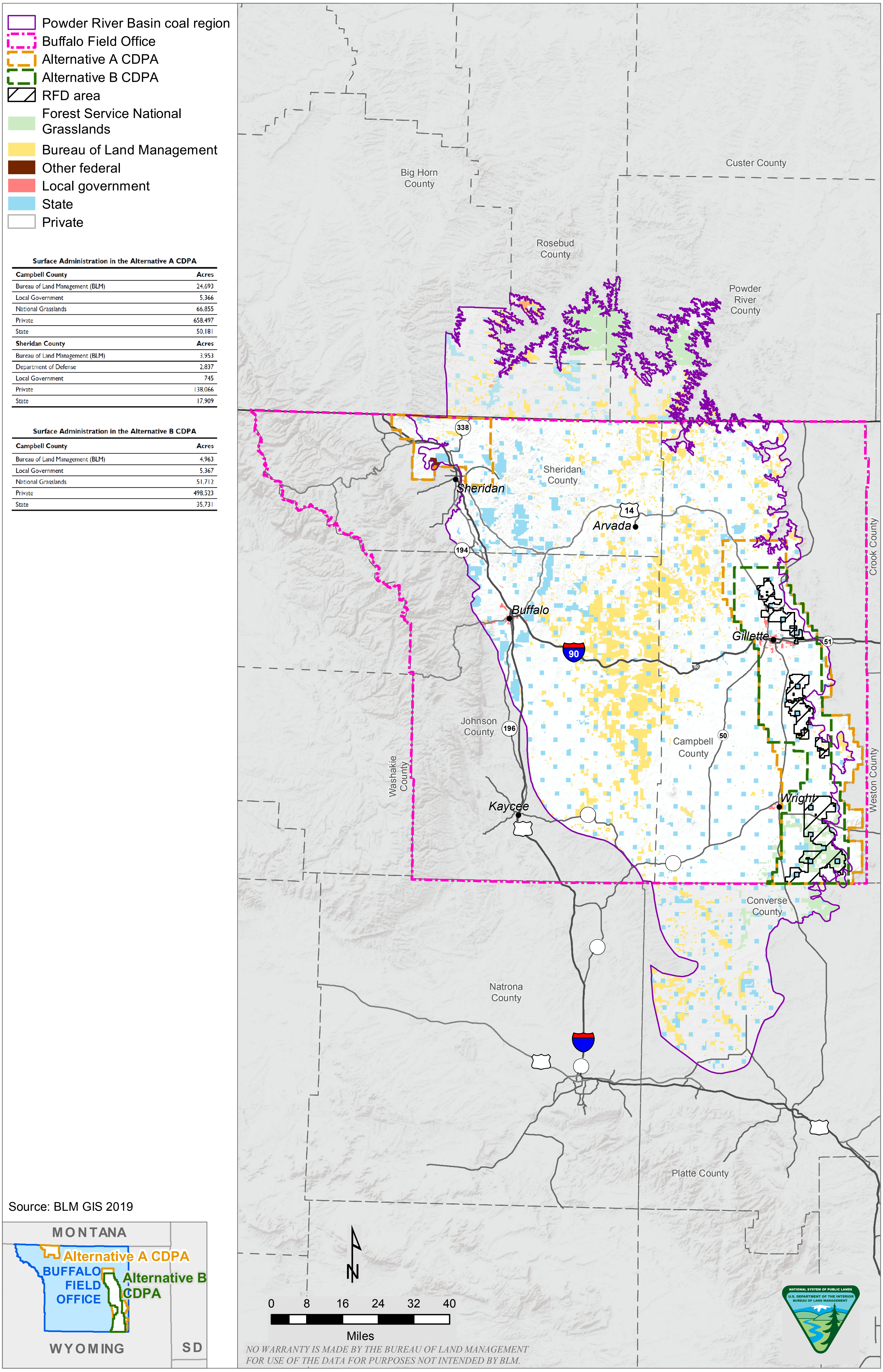
## ES.5 PLANNING CRITERIA

Planning criteria guide development of the SEIS by defining the decision space. In 40 CFR 1610.4-2(b), the government states that the "Planning criteria will generally be based upon applicable law, Director and State Director guidance, the results of public participation, and coordination with any cooperating agencies and other Federal agencies, State and local governments, and federally recognized Indian tribes."

Planning criteria represent the overarching factors used to resolve issues and develop alternatives. The planning criteria considered in the development of this document are as follows:

- Addresses BLM-administered surface lands and subsurface mineral estate
- Supplements the 2015 Proposed RMP/Final EIS by providing additional analysis in response to a US District Court order
- Uses a collaborative and multi-jurisdictional approach to determine the desired future condition of public lands
- Complies with NEPA, FLPMA, and other applicable laws, executive orders, regulations, and policy
- Recognizes valid existing rights
- Does not change existing planning decisions that are still valid

## Figure ES-1
## Decision Area



**Surface Administration in the Alternative A CDPA**

| Campbell County | Acres |
|---|---|
| Bureau of Land Management (BLM) | 24,693 |
| Local Government | 5,366 |
| National Grasslands | 66,855 |
| Private | 658,497 |
| State | 50,181 |
| **Sheridan County** | **Acres** |
| Bureau of Land Management (BLM) | 3,953 |
| Department of Defense | 2,837 |
| Local Government | 745 |
| Private | 138,066 |
| State | 17,909 |

**Surface Administration in the Alternative B CDPA**

| Campbell County | Acres |
|---|---|
| Bureau of Land Management (BLM) | 4,963 |
| Local Government | 5,367 |
| National Grasslands | 51,712 |
| Private | 498,523 |
| State | 35,731 |

Source: BLM GIS 2019

*NO WARRANTY IS MADE BY THE BUREAU OF LAND MANAGEMENT FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM.*

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## ES.6 MANAGEMENT ALTERNATIVES

Planning challenges identified through public scoping and the court order helped the ID Team identify key planning issues to be addressed in the draft SEIS/RMPA. Based on internal and external scoping, the BLM identified and developed two alternatives. **Table ES-1**, below, shows a comparison of alternatives.

The BLM updated the resource data for Alternative A (the No Action Alternative), conducted new screening for Alternative B (**Appendix A**), and updated the reasonably foreseeable development scenario (**Appendix B**) for both alternatives.

**Table ES-1**
**Alternatives Summary and Coal Acceptability for Leasing**

| Alternative | Acres Acceptable |
|---|---|
| Alternative A: No Action Alternative | 686,896 |
| Alternative B | 455,467 |

Source: BLM GIS 2019

### ES.6.1 Alternative A: No Action Alternative

For Alternative A, the BLM brought forward all management decisions that prevented coal development in the 2015 Proposed RMP/Final EIS. In addition, the BLM used information from the 2001 coal screening process (see Appendix D of the 2015 Proposed RMP/Final EIS; BLM 2015), the coal development potential area (CDPA), and updated data to determine a baseline for coal availability.

### ES.6.2 Alternative B

Under Alternative B, the BLM updated all the coal screens. The BLM refined the CDPA, based on coal quality and stripping ratios (cost to produce) and current economic forecasts, to reduce the overall area acceptable for further consideration for coal leasing (**Table ES-1**).

## ES.7 ENVIRONMENTAL CONSEQUENCES

The purpose of the environmental consequences analysis in this SEIS/RMPA is to determine the potential for significant impacts of the federal action on lands considered acceptable for further consideration for coal leasing. The Council on Environmental Quality regulations for implementing NEPA state that the human environment is interpreted comprehensively to include the natural and physical environment and the relationship of people with that environment (40 CFR 1508.14). The federal action is the BLM's selection of an alternative that the BLM BFO will base future land use actions related to coal leasing availability.

This SEIS/RMPA is in response to the US District Court's court order. Resources eliminated from impacts analysis are included in **Table 1-3** of **Chapter 1**; resources carried forward for analysis are included in **Chapter 3**. It objectively evaluates the likely direct, indirect, and cumulative impacts on the human and natural environment in terms of environmental, social, and economic consequences that are projected to occur from implementing the alternatives. A summary of impacts for each resource is in **Table ES-2**.

## Table ES-2
## Impacts Summary for Resources Carried Forward

| Resources Brought Forward for Analysis | Impacts Common to all Alternatives |
|---|---|
| Air resources, including Greenhouse Gas and Climate Change | • Production, transportation, and downstream combustion of federal coal would produce an estimated 398.9 million metric tons of carbon dioxide equivalents (MMT $CO_2e$) annually for the 20-year global warming potential. This represents approximately 6.2 percent of national emissions and 0.77 percent of global emissions. For the 100-year global warming potential, emissions are estimated at 367.7 MMT $CO_2e$ annually. This represents approximately 5.7 percent of national emissions and 0.71 percent of global emissions.<br>• Production and downstream combustion of federal oil and federal conventional and coalbed natural gas would produce an estimated 5.1 MMT $CO_2e$ annually for the 20-year global warming potential. This represents approximately 0.08 percent of national emissions and 0.01 percent of global emissions. For the 100-year global warming potential, emissions are estimated at 4.6 MMT $CO_2e$ annually. This represents approximately 0.07 percent of national emissions and 0.01 percent of global emissions.<br>• Cumulative annual average emissions (federal and nonfederal sources and other major sources in the planning area) would be 456.7 MMT $CO_2e$ and 440.3 MMT $CO_2e$, respectively, using the 20-year and 100-year time horizon global warming potentials. Cumulative annual average emissions over the plan period would be between approximately 1.5 percent and 0.6 percent of global emissions under different future global representative concentration scenarios and would contribute, in part, to climate change impacts. |
| Economic considerations | • Based on recent production volumes per worker at the 12 coal mines, federal coal production is forecast to support 3,413 coal jobs and $391.3 million in direct labor income on annual average over the next 20 years. The indirect and induced employment stimulated by production in the coal industry is projected to support another 5,300 jobs and $343.5 million in labor income across seven counties that are impacted by development in the field office (Campbell, Converse, Crook, Johnson, Natrona, Sheridan and Weston Counties).<br>• Revenues generated through BFO coal production and disbursed according to legal statutes are substantial and account for a large share of total state and local revenues each year. On an annual average, leasing and production of federal coal in the BFO is projected to generate $346.3 million, between 2019 and 2038. These revenues are subject to federal royalties, assessed at 12.5 percent of the minerals' gross market value; state severance taxes are 7 percent, and local ad valorem taxes.<br>• Future declines in coal production, based on forecast market conditions, are likely to cause local governments and special districts to face budget deficits. |

| Resources Brought Forward for Analysis | Impacts Common to all Alternatives |
|---|---|
| Biological resources (Unsuitability Criteria #9, 11, 12, 14, and 15) | • There is no critical habitat or habitat of essential value for threatened or endangered species. If there were potential for federally listed species in a coal project site, appropriate surveys for them and their suitable habitat would made. If any were identified, the BLM would begin ESA Section 7 consultation. This would ensure that coal mining would not jeopardize threatened and endangered species at the project level.<br>• Site-specific surveys for each lease area and appropriate perimeters would be part of the mine permitting process if the tracts are leased. This would include appropriate surveys for BLM special status species, coordination with state and federal wildlife agencies, and creation of a mining plan, which could include site-specific mitigation and habitat restoration. |

Source: BLM GIS 2019

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# Chapter 1. Purpose and Need

In accordance with the National Environmental Policy Act of 1969, as amended (NEPA), and the Federal Land Policy and Management Act of 1976, as amended (FLPMA), the Bureau of Land Management (BLM) Wyoming Buffalo Field Office (BFO) prepared this supplemental environmental impact statement (SEIS) and potential resource management plan amendment (RMPA) for the 2015 BFO Approved Resource Management Plan (RMP). This SEIS/RMPA is in response to a United States District Court, District of Montana, opinion and order (*Western Organization of Resource Councils, et al. v. BLM [CV 16-21-GF-BMM]*).

This SEIS/RMPA is prepared in accordance with the NEPA; Council on Environmental Quality (CEQ) regulations implementing NEPA (40 Code of Federal Regulations [CFR] 1500-1508); Department of Interior NEPA regulations (43 CFR 46); and the requirements of the BLM's NEPA Handbook, H-1790-1 (BLM 2008). The Record of Decision for the SEIS/RMPA will be signed by November 29, 2019, in accordance with the US District Court's order.

## 1.1 PURPOSE OF AND NEED

This SEIS/RMPA is needed for the following reasons:

- Consider an alternative that would reduce the amount of recoverable coal and consider climate change impacts, in order to make a reasoned decision on the amount of recoverable coal made available
- Supplement the analysis of the environmental consequences of downstream combustion[1] emissions of coal, oil, and gas open to development
- Justify the time horizon of the estimated global warming potential impacts—for example, 20-year or 100-year—and acknowledge the evolving science in this area

The purpose of this SEIS/RMPA is to provide additional analysis for land use planning, specifically for analyzing coal, oil, and gas in the BFO and to determine the lands to be made available for coal leasing. To support analysis in the SEIS/RMPA and subsequent decision-making, the BLM has conducted new coal screening, in accordance with 43 CFR 3420.1–4.

## 1.2 DESCRIPTION OF THE DECISION AREA

The BFO administers approximately 800,000 acres of surface lands and 4.7-million acres of subsurface federal mineral estate in Campbell, Johnson, and Sheridan Counties in north-central Wyoming. The decision area is BLM-administered federal coal in the BFO. This includes approximately 4.7 million acres of subsurface federal mineral coal estate for which the BLM has the authority to determine its availability (**Figure 1-1**).

## 1.3 SCOPING ISSUES

The BFO SEIS/RMPA public scoping process began on November 28, 2018, with publication of the Notice of Intent (NOI) in the *Federal Register* (FR) (83 FR 61167); it ended on December 28, 2018. On December 19 the BFO conducted a public scoping meeting in Gillette, Wyoming; six people attended. The BLM announced the meeting through the NOI in the *Federal Register*, the BLM project website

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[1] Combustion of coal, oil, or gas at a location different from the place of production or development.

(https://eplanning.blm.gov), and news releases. The BFO has provided public access to BFO SEIS/RMPA-related information on its ePlanning website, https://go.usa.gov/xP6S3.

The BFO received 37 unique submissions that included 278 comments in eight issue categories. Most comments were received for the following resource-specific issues: coal, oil and gas, air quality, climate change, economic issues, best available information/baseline data, and the range of alternatives. Detailed information can be found in the scoping report on the BFO SEIS/RMPA ePlanning website.

### 1.3.1 Issues Identified for Detailed Consideration

During alternatives development, the BLM focused on issues raised by the court and by the public in relation to the court order. A detailed description of the planning issues identified during public scoping can be found in the scoping report on the BFO SEIS/RMPA ePlanning website. **Table 1-1** aligns the planning issues identified for detailed consideration with the resources affected by the issues. **Chapter 3** has a discussion of the issues as it pertains to the identified resources.

**Table 1-1**
**Scoping Issues and the Resource Topics Affected**

| Issue | Resource Topics Affected |
|---|---|
| What new information will be referenced in the SEIS? | Air resources (including greenhouse gases and climate change), coal, and economics will all be updated, based on the following:<br>• 2018 minerals production data<br>• US Energy Information Administration (EIA) 2019 forecast<br>• New coal screening<br>• Updated reasonably foreseeable development scenario<br>• Greenhouse gas emissions inventory and downstream combustion emissions<br>The BLM will update resource data for the coal development potential areas (CDPAs)[2] |
| What are the cumulative impacts of proposed actions for minerals development in the SEIS, and will the BLM prepare additional assessments to analyze these impacts? | The BLM evaluated resources through the coal screening process; see **Appendix A**. |
| What are the direct and indirect impacts of proposed actions for minerals development in the SEIS? | See **Chapter 3** for impacts analysis for resources carried forward. |
| Will the Buffalo Field Office SEIS consider a no-leasing alternative? What alternatives will be included in the SEIS? | BLM did consider a no-leasing alternative. See **Chapter 2** for all alternatives considered. |
| What methods will be used to address downstream impacts of fossil fuel leasing and use? Will any alternatives contain requirements or lease stipulations requiring emission control technologies? | See **Chapter 3**, Air Resources, including Greenhouse Gases and Climate Change; see **Chapter 2** for alternatives descriptions. |

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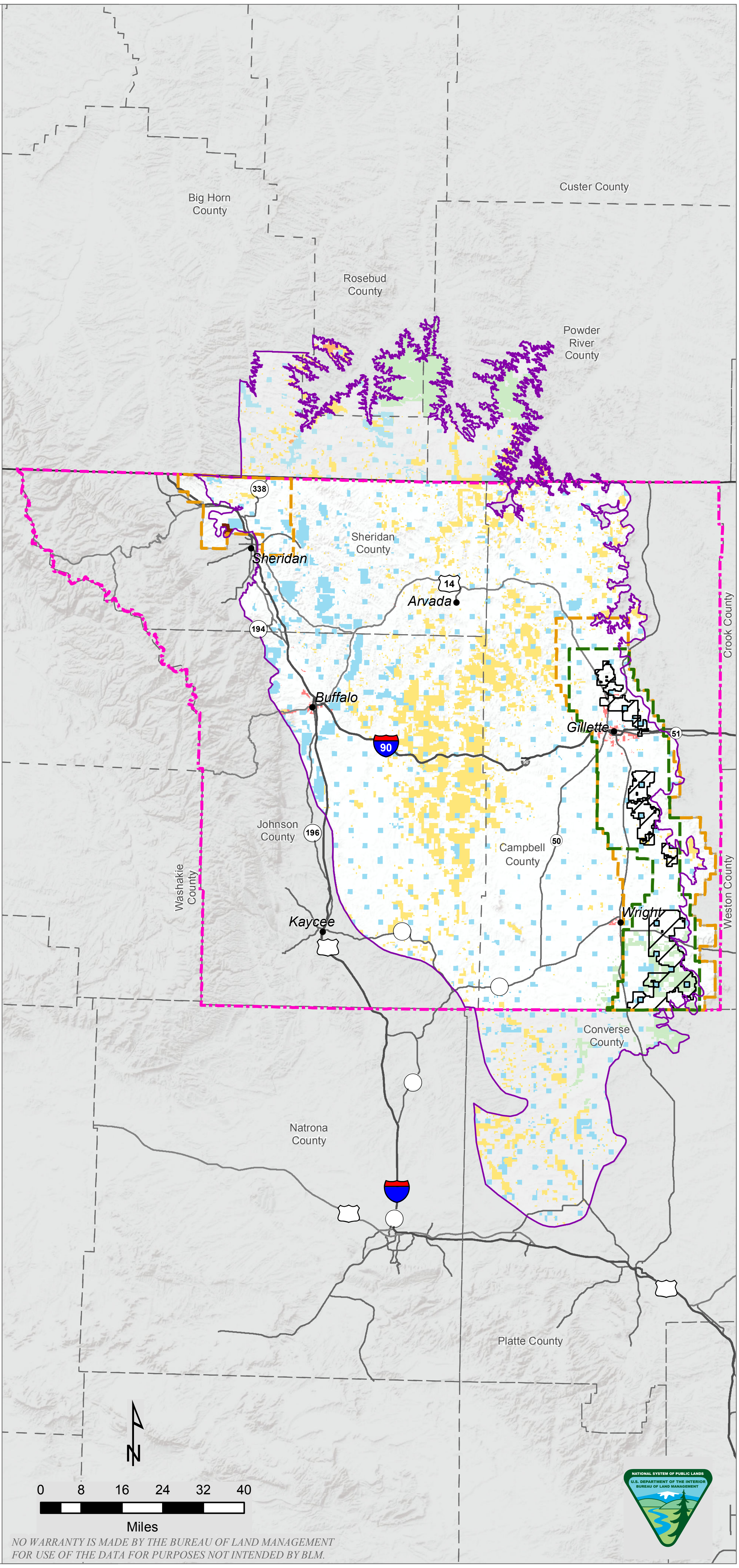
[2] The Alternative A CDPA is the same as the 2015 Proposed RMP/Final EIS CDPA. The Alternative B CDPA reduces acres acceptable for further consideration for leasing by 34 percent based on the coal screening criteria.

**Figure 1-1**
**Decision Area**



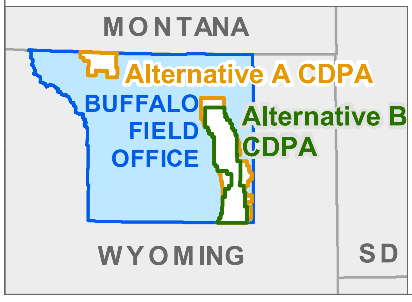
**Surface Administration in the Alternative A CDPA**

| **Campbell County** | **Acres** |
|---|---|
| Bureau of Land Management (BLM) | 24,693 |
| Local Government | 5,366 |
| National Grasslands | 66,855 |
| Private | 658,497 |
| State | 50,181 |
| **Sheridan County** | **Acres** |
| Bureau of Land Management (BLM) | 3,953 |
| Department of Defense | 2,837 |
| Local Government | 745 |
| Private | 138,066 |
| State | 17,909 |

**Surface Administration in the Alternative B CDPA**

| **Campbell County** | **Acres** |
|---|---|
| Bureau of Land Management (BLM) | 4,963 |
| Local Government | 5,367 |
| National Grasslands | 51,712 |
| Private | 498,523 |
| State | 35,731 |

Source: BLM GIS 2019



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| **Issue** | **Resource Topics Affected** |
|---|---|
| Will the BLM quantify downstream combustion emissions for fossil fuels, analyze the impacts of these emissions with available methods under each alternative, and study the extent to which the alternatives (including a no leasing alternative) alter the total amount of downstream greenhouse gas emissions? | See **Chapter 2** for a range of alternatives and **Chapter 3**, Air Resources, including Greenhouse Gases and Climate Change. |
| How will the BLM comply with the FLPMA's multiple-use mandate? | This SEIS supplements the existing RMP, meeting the multiple-use mandate of FLPMA. The BLM considered multiple uses when evaluating Screen 3; see **Appendix A**, Coal Screening Process. |
| Will the BLM recognize the US Environmental Protection Agency's (USEPA) delegation of air quality regulation to the State of Wyoming in the SEIS? | Yes, BLM recognizes the delegation of air quality regulation to the State. See **Chapter 3**, Air Resources, including Greenhouse Gases and Climate Change. |
| Will the BLM change estimates of recoverable reserves near existing mines? | See **Appendix A**, Coal Screening Process. |
| Will the BLM conduct new coal screening for the planning area? | See **Appendix A**, Coal Screening Process. |
| How will the BLM consider changed circumstances since the original RMP/EIS? | See **Chapter 2** for alternatives description, **Appendix A**, Coal Screening Process and **Appendix B**, Reasonably Foreseeable Development. |
| What are the impacts and external costs of mining, transporting, and burning coal? | See **Chapter 3** for impacts analysis for Economic Considerations. |
| Will the BLM make updates to the reasonably foreseeable development scenario to clarify when limitations on mineral development could occur? | See **Appendix B**, Reasonably Foreseeable Development. |
| What are the lifecycle emissions for oil and gas development? | See **Chapter 3**, Air Resources, including Greenhouse Gases and Climate Change, and **Appendix C**, Air Resources Technical Report. |
| How will the BLM recognize the place of oil and gas development in the multiple-use mandate and the rights of existing oil and gas leases? | The 2015 Proposed RMP/Final EIS made leasing decisions for oil and gas; valid existing rights will be honored during implementation of the plan. Also see **Appendix A**, Coal Screening Process. |
| What sources of air emissions will be included in the SEIS? | See **Chapter 3**, Air Resources, including Greenhouse Gases and Climate Change, and **Appendix C**, Air Resources Technical Report. |
| How do regional emissions compare with federal emissions? | See **Chapter 3**, Air Resources, including Greenhouse Gases and Climate Change, and **Appendix C**, Air Resources Technical Report. |
| How will greenhouse gas emissions be quantified and analyzed in the potential actions, in order to avoid regional and national greenhouse gas emissions? | See **Chapter 3**, Air Resources, including Greenhouse Gases and Climate Change, and **Appendix C**, Air Resources Technical Report. |
| Will there be a federal emissions baseline? | See **Chapter 3**, Air Resources, including Greenhouse Gases and Climate Change, and **Appendix C**, Air Resources Technical Report. |
| Will the BLM update global warming potential data for methane? | See **Chapter 3**, Air Resources, including Greenhouse Gases and Climate Change, and **Appendix C**, Air Resources Technical Report. |

| Issue | Resource Topics Affected |
|---|---|
| Will the SEIS incorporate the newest National Climate Assessment and other national and state climate literature? | See **Chapter 3**, Air Resources, including Greenhouse Gases and Climate Change, and **Appendix C**, Air Resources Technical Report. |
| What are the social effects of greenhouse gas emissions that result from fossil fuel extraction and use? | See **Chapter 3**, Air Resources, including Greenhouse Gases and Climate Change and **Appendix D**, Economic Technical Appendix. |
| What tools will the BLM use to examine the economic contribution to the region from fossil fuel employment? | See **Chapter 3**, Economic Considerations and **Appendix D**, Economic Technical Appendix. |
| How will the BLM analyze the impacts of noise on wildlife? | See **Chapter 3**, Biological Resources, and **Appendix A**, Coal Screening Report. |
| How will coal development affect wildlife and aquatic species, and how will the BLM mitigate these impacts? | See **Chapter 3**, Biological Resources, and **Appendix A**, Coal Screening Report. |
| How will management actions in the SEIS affect Greater Sage-Grouse? | See **Chapter 3**, Biological Resources, and **Appendix A**, Coal Screening Report, in compliance with Wyoming conservation strategy. |

### 1.3.2 Issues Considered but Not Further Analyzed in this SEIS/RMPA

The issues identified during public scoping (discussed above) shaped the alternatives carried forward in this SEIS/RMPA. The BLM also considered other issues identified during public scoping but did not analyze them further; this is because they fall outside of the BLM's jurisdiction or are beyond the scope of this SEIS/RMPA (**Table 1-2**). A list of these issues and the rationale for not analyzing them further are provided below.

**Table 1-2**
**Scoping Issues not Further Analyzed and the Rationale**

| Issue | Rationale |
|---|---|
| Will the BLM resume its programmatic review of the federal coal leasing program? | This is out of scope; the programmatic review of the federal coal leasing program is a process that is separate from this SEIS/RMPA. |
| Will the BLM update the coal resource task reports? | This is out of scope; the coal resource task reports looked at what coal resources are in the Powder River Basin, and it is a separate process from this SEIS. |
| How has policy guidance regarding oil and gas leasing changed market conditions? | This is out of scope and was not directed by the court order. |
| What types of conditions will the BLM use to reduce impacts from oil and gas development on resources in the planning area? | This is out of scope. Fluid mineral mitigation measures were identified in the 2015 Proposed RMP/Final EIS. |
| How will the BLM analyze potential impacts of hydraulic fracturing in the SEIS/RMPA? | This is out of scope. The court order asked only that, in the SEIS/RMPA, the BLM look at downstream combustion emissions of oil and gas. |
| Will the SEIS/RMPA analyze the risk of "carbon lock-in"? | This is out of scope. In the 2015 Proposed RMP/Final EIS, the BLM considered all forms of energy development, including coal, oil and gas, geothermal, and renewable energy. |
| How will toxic air emissions be mitigated? | This is out of scope because it does not meet the purpose and need of the SEIS/RMPA. Air quality mitigation measures were identified in the 2015 Proposed RMP/Final EIS. In addition, **Chapter 3** discusses greenhouse gas emissions and climate change. |

| Issue | Rationale |
|---|---|
| How will the BLM differentiate air quality management between federal and state agencies? | This is out of scope because it does not meet the purpose and need of the SEIS/RMPA. Analysis was included as part of the 2015 Proposed RMP/Final EIS. |
| How will air pollution affect regional air quality, and how will the BLM analyze criteria air pollutants? | This is out of scope. An analysis of impacts on air quality in the planning area and emissions of criteria pollutants were adequately addressed in the 2015 Proposed RMP/Final EIS. |
| What is the impact of fossil fuel extraction and use on public health and safety? | This is out of scope because it does not meet the purpose and need of the SEIS/RMPA. Analysis was included as part of the 2015 Proposed RMP/Final EIS. |
| How does fossil fuel development affect surface and groundwater resources? | This is out of scope because it does not meet the purpose and need of the SEIS/RMPA. Analysis was included as part of the 2015 Proposed RMP/Final EIS. |
| What is the projected monetized value of impacts from coal development in the planning area, and how do these relate to the value of the projected coal extraction? | The BLM is not required to do a cost-benefit analysis under NEPA (40 CFR 1502.23). It conducted an economic contribution analysis to analyze the potential economic output of forecasted coal development in the decision area (see **Chapter 3**, Economic Considerations). |
| Will the BLM analyze effects on the energy market of coal leasing decisions in the planning area? How will the BLM ensure a fair return to taxpayers from federal coal leasing? | This is out of scope. Coal price and quality are comparable across the Powder River Basin (PRB). The mines have sufficient capacity to expand their production to replace any decrease in coal production at a comparable delivered price. |
| Will the BLM analyze the economic resilience of communities in the planning area? | This is out of scope. The analysis acknowledges the relative importance of the coal industry in the context of the geographic area; however, the economic resilience is not germane to this analysis. |
| How will the BLM establish future commercial interest in operating on federal lands? | This is out of scope because it does not meet the purpose and need of the SEIS/RMPA. Establishing commercial interest on federal lands is not part of the purpose or need for this SEIS. |

### 1.3.3 Resource Topics Not Carried Forward for Analysis

**Table 1-3** lists the resources eliminated from further analysis and the rationale for their elimination.

**Table 1-3**
**Resources Eliminated from Further Analysis and the Rationale**

| Resource | Rationale |
|---|---|
| Prime and unique farmlands | This resource does not exist in the CDPAs. |
| Water resources – municipal watersheds and National Resource Waters | These resources do not exist in the CDPAs. |
| Fish and wildlife not brought forward under Coal Screens 2 or 3 | No change in impacts from the 2015 Proposed RMP/Final EIS. |
| Wild horses and burros | This resource does not exist in the CDPAs. |
| Wildland fire management | No change in impacts from 2015 Proposed RMP/Final EIS. |
| Wilderness areas | This resource does not exist in the CDPAs. |
| Forest and woodland products | No commercial forest or woodland communities are in the CDPAs. |

| Resource | Rationale |
|---|---|
| Travel and transportation management | No change in impacts from the 2015 Proposed RMP/Final EIS. |
| Recreation, including Special Recreation Management Areas | No change in impacts from the 2015 Proposed RMP/Final EIS. |
| Areas of Critical Environmental Concerns | Excluded, based on Screen 3 multiple use conflicts. |
| Lands and realty land tenure decisions | No change in impacts from the 2015 Proposed RMP/Final EIS. |
| Livestock grazing | No change in impacts from the 2015 Proposed RMP/Final EIS. |
| Leasable minerals; coal | No change in impacts from the 2015 Proposed RMP/Final EIS. Analysis required from the court order is in Chapter 3. |
| Leasable minerals: fluids | No change in impacts from the 2015 Proposed RMP/Final EIS. Analysis required from the court order is included under air resources. |
| Locatable minerals | This resource use does not occur in the CDPAs. |
| Mineral materials | No change in impacts from the 2015 Proposed RMP/Final EIS. |
| Nonenergy leasable minerals | This resource use does not occur in the CDPAs. |
| Renewable energy | This resource use does not occur in the CDPAs. |
| National Trails | This resource does not exist in the CDPAs. |
| Wild and Scenic Rivers | This resource does not exist in the CDPAs. |
| Backcountry Byways | This resource does not exist in the CDPAs. |
| Wilderness Study Areas | This resource does not exist in the CDPAs. |
| Environmental justice | No change in impacts from the 2015 Proposed RMP/Final EIS. |

## 1.4 PLANNING CRITERIA AND REGULATORY CONSTRAINTS

### 1.4.1 Planning Criteria

Planning criteria guide development of the SEIS/RMPA by defining the decision space. 43 CFR 1610.4–2(b) states that the “Planning criteria will generally be based upon applicable law, Director and State Director guidance, the results of public participation, and coordination with any cooperating agencies and other Federal agencies, State and local governments, and federally recognized Indian tribes.”

Planning criteria represent the overarching factors used to resolve issues and to develop alternatives. The planning criteria considered in the development of this document are as follows:

- The SEIS/RMPA complies with NEPA, FLPMA, and other applicable laws, executive orders, regulations, and policy.
- Lands covered in the SEIS/RMPA will be federal lands, including split estate, managed by the BLM. No decisions will be made relative to non-BLM-administered lands.
- In the SEIS/RMPA, the BLM makes land use planning decisions to determine lands acceptable for further consideration for coal leasing.
- In the SEIS/RMPA, the BLM uses a collaborative and multi-jurisdictional approach to determine the desired future condition of public lands.

- Decisions in the plan will be compatible with existing plans and policies of adjacent local, state, federal, and tribal agencies, as long as the decisions are consistent with the purposes, policies, and programs of federal laws and regulations applicable to public lands.
- The SEIS/RMPA recognizes valid existing rights.
- The SEIS/RMPA does not change existing planning decisions that are still valid.

This is not intended to be a full EIS/RMP revision; rather, it is to provide additional analysis for land use planning as it pertains to air quality, climate change, coal, oil, gas, and economics and to make plan-level decisions for availability of coal resources, consistent with the US District Court's order. Due to the limited focus of planning, the BLM did not address decisions that would normally be considered in a full RMP revision.

### 1.4.2 Regulatory Constraints

#### *Coal Screening Process*

The BLM's authority to manage BFO coal resources comes from the Mineral Leasing Act of 1920, as amended, the Mineral Leasing Act for Acquired Land of 1947, as amended, and FLPMA. Regulations developed from these statutes and FLPMA are found in 43 CFR 3000 and 3400; these regulations guide the BLM's coal program management, setting requirements for land use planning, leasing, and post lease maintenance.

Coal planning regulations in 43 CFR 3420.1–4 require the BLM to identify federal lands acceptable for further consideration for leasing. These lands are analyzed in the land use planning process. The four coal screens are applied as follows:

1. Identification of coal with development potential—Lands determined to have development potential are considered acceptable for further consideration for leasing and are applied to the remaining coal screens. Lands determined to not have development potential are eliminated from further consideration from leasing.
2. Application of unsuitability criteria—Lands with coal potential are assessed with procedures outlined in 43 CFR 3461. Lands in the coal potential area may be eliminated from further consideration from leasing if they are determined to be unsuitable without stipulation or exception. In accordance with 43 CFR 3461.2-1 and based on additional site-specific surveys or change resource conditions, the BLM could change the unsuitability determination of a given tract at the activity planning stage.
3. Multiple use conflict analysis—43 CFR 3420.1-4e(3) states that "multiple land use decisions shall be made which may eliminate additional coal deposits from further consideration for leasing, to protect resource values of a locally important or unique nature not included in the unsuitability criteria." Lands in the coal potential area may be eliminated from further consideration for leasing where multiple uses conflict.
4. Surface owner consultation—This screen requires the BLM to consult with qualified surface owners whose land overlies federal coal with development potential. The BLM asks the owners for their preference for or against offering the coal deposits under their land for lease. Lands within the coal potential area may be eliminated from further consideration for leasing, based on the preference of the qualified surface owner.

Federal lands determined to be acceptable for further consideration for leasing through coal screening in the BFO are the subject of this SEIS/RMPA analysis; results of the coal screening process are in **Appendix A**.

### *Coal and Mineral Leasing Management Specific Laws, Regulations, and Policies*

The BLM has several laws, regulations, and policies that guide its management of federal coal resources, as follows:

- The Mineral Leasing Act of 1920, as amended
- The Mineral Leasing Act for Acquired Land of 1947, as amended
- Federal Coal Leasing Amendments Act of 1976
- FLPMA
- Surface Mining Control and Reclamation Act of 1977
- 43 CFR 3000 and 3400

### *Relationship to Other Federal Laws, Regulations, Policies, and Programs*

The following federal and state laws and applicable regulations, policies, and actions affect the alternatives analyzed in the SEIS/RMPA:

- NEPA
- Clean Air Act
- Energy Policy Act of 2005
- Clean Water Act

See the BFO 2015 Proposed RMP/Final EIS for the full list of additional laws, regulations, policies, and programs that are relevant to this analysis.

FLPMA is the primary authority for the BLM's management of public lands. It provides the policy by which the BLM manages resources on BLM-administered lands and mineral estate. The BFO will make decisions for coal leasing availability under this SEIS/RMPA; the BLM is required to follow the mandates of FLPMA when making those decisions.

The land use decisions made in this SEIS/RMPA require analysis under NEPA. The BFO will analyze the impacts of the coal leasing decisions on the other resources identified in the decision area, including air quality, climate change, economics, and the other resources identified in **Table 1-1**.

## 1.5 COLLABORATION

The BLM is engaging in ongoing collaboration with federal, tribal, state, and local governments as part of this SEIS/RMPA. This collaboration includes continuing to engage Native American tribes for government-to-government consultation, the participation of cooperating agencies, and consultation with regulatory agencies, as required by law. **Appendix E**, Consultation and Coordination, provides more information about the involvement of these stakeholders.

## 1.6 RELATIONSHIP TO STATE AND LOCAL PLANS

The BLM has considered plans of other state, local, and federal agencies that are relevant in the development of this SEIS/RMPA. The BLM was consistent with these plans, as required by the consistency provisions of FLPMA (43 USC 1712[c][9]) and the BLM's planning regulations at 43 CFR 1610.3-2. The plans considered during this supplemental analysis are consistent with and listed in the 2015 Proposed RMP/Final EIS (Section 1.4.4, pp. 15 and 16).

# Chapter 2. Alternatives

## 2.1 INTRODUCTION

The BLM considered two alternatives in this SEIS/RMPA. They were developed in coordination with cooperating agencies, interested stakeholders (including private landowners and city, county, and state governments) and from comments received from the general public during the public scoping period.

## 2.2 ALTERNATIVES DEVELOPMENT

The SEIS/RMPA alternatives focus solely on coal leasing in response to the federal district court's order in *Western Organization of Resource Councils v. Bureau of Land Management, Civil Action No. 4:2016cv00021* (D. Mont. 2017) (hereinafter, order). The range of alternatives meets the purpose and need for the SEIS/RMPA and responds to issues raised during scoping (see **Chapter 1**, **Section 1.3**, p. 1-2 and BLM Buffalo Field Office RMP SEIS Scoping Report, BLM 2019). In addition, the BLM refined alternatives by updating the coal screening (**Appendix A**) and revising the reasonably foreseeable development (RFD) scenario (**Appendix B**). The alternatives are described in detail in **Sections 2.2.1** and **2.2.2**.

A summary of lands acceptable for further consideration for coal leasing and development for the alternatives is provided in **Tables 2-1**, **2-2**, **2-3**, and **2-4**.

### 2.2.1 Alternative A: No Action Alternative

For Alternative A, the BLM brought forward all management decisions that prevented coal development in the 2015 Proposed RMP/Final EIS. In addition, the BLM used information from the 2001 coal screening process (2015 Proposed RMP/Final EIS, Appendix D; BLM 2015), updated resource data where applicable, and determined a baseline for coal acceptability for further consideration for leasing.

**Figure 2-1** shows the coal acceptability geospatial results, based on the 2001 coal screening process, along with volume. **Table 2-1** depicts the coal screening results; **Table 2-2** depicts the overall coal acceptability results for Alternative A.

**Table 2-1**
**Coal Screening Results for Alternative A**

| Coal Screening Criteria[1] | Total |
|---|---|
| CDPA (acres) | 720,033[2] |
| Unsuitable for all methods of coal mining without exception (acres) | 30,735[2] |
| Unsuitable for all or certain stipulated methods of coal mining with exception (acres) | 65,497[2] |
| Multiple use screen (acres) | 2,402[2] |
| Landowners contacted | 569 |
| **Total Volume (billion tons)** | **73.66** |

Source: BLM GIS 2019

[1] See 2015 RMP Appendix D for full coal screening results.

[2] Coal potential includes federal coal, excluding areas where the Forest Service manages the surface. It also includes existing lease actions and areas already mined but outside of existing leases.

**Table 2-2**
**Coal Acceptability Results for Alternative A[1]**

| Location[2] | Acceptable (Acres) | Unacceptable (Acres) |
|---|---:|---:|
| Campbell County | 618,742 | 27,993 |
| Sheridan County | 68,154 | 5,144 |
| **Total** | **686,896** | **33,137** |

Source: BLM GIS 2019
[1] Total volume: 73.66 billion tons
[2] Inside the CDPA

Alternative A represents high coal economic development potential before the rise of natural gas and renewable energy. Higher development potential allows for access to lower quality, deeper coal reserves and a larger CDPA.

### 2.2.2 Alternative B

Starting with the Alternative A CDPA, the BLM reduced the CDPA boundary by applying lower strip ratios and retaining higher quality coal (see **Appendix A** for the details). The biggest change from the Alternative A CDPA is the exclusion of Sheridan County, based on changes in economic forecast since 2001. **Figure 2-2** shows the Alternative B CDPA; it represents a 34 percent reduction in coal acceptability, compared with the Alternative A CDPA. Using updated data, the BLM also evaluated lands for the unsuitability criteria, the multiple land use decisions, and consultation with qualified surface owner screens. See **Appendix A** for results of the evaluations.

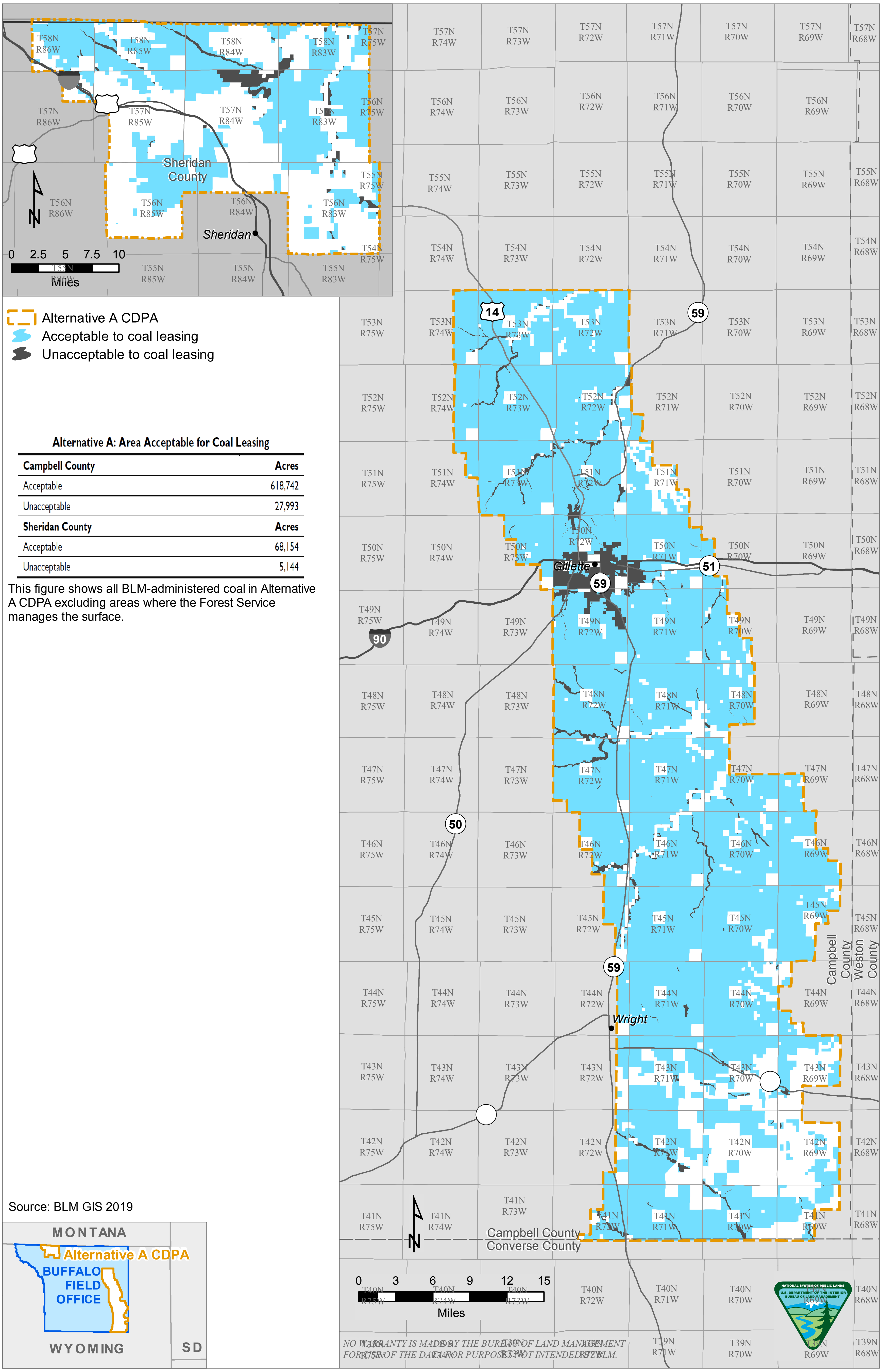
**Figure 2-2** shows the coal acceptability geospatial results of the four-step coal screening process for Alternative B, along with volume. **Table 2-3** depicts the coal screening results; **Table 2-4** depicts the overall coal acceptability results for Alternative B.

**Table 2-3**
**Coal Screening Results for Alternative B**

| Coal Screening Criteria[1] | Total |
|---|---:|
| Coal potential (acres) | 481,139[2] |
| Unsuitable for all methods of coal mining without exception (acres)[2] | 24,791[2] |
| Unsuitable for all or certain stipulated methods of coal mining with exception (acres)[2] | 34,826[2] |
| Multiple use screen (acres)[2] | 881[2] |
| Landowners Contacted and evaluated | 372 |
| **Total volume (billion tons)** | **52.24** |

Source: BLM GIS 2019
[1] See **Appendix A** for full coal screening results.
[2] Coal potential includes federal coal, excluding areas where the Forest Service manages the surface. It also includes existing lease actions and areas already mined but outside of existing leases.

## Figure 2-1
## Alternative A, No Action



- ▭ Alternative A CDPA
- 🟦 Acceptable to coal leasing
- ■ Unacceptable to coal leasing

**Alternative A: Area Acceptable for Coal Leasing**

| **Campbell County** | **Acres** |
|---|---|
| Acceptable | 618,742 |
| Unacceptable | 27,993 |
| **Sheridan County** | **Acres** |
| Acceptable | 68,154 |
| Unacceptable | 5,144 |

This figure shows all BLM-administered coal in Alternative A CDPA excluding areas where the Forest Service manages the surface.

Source: BLM GIS 2019

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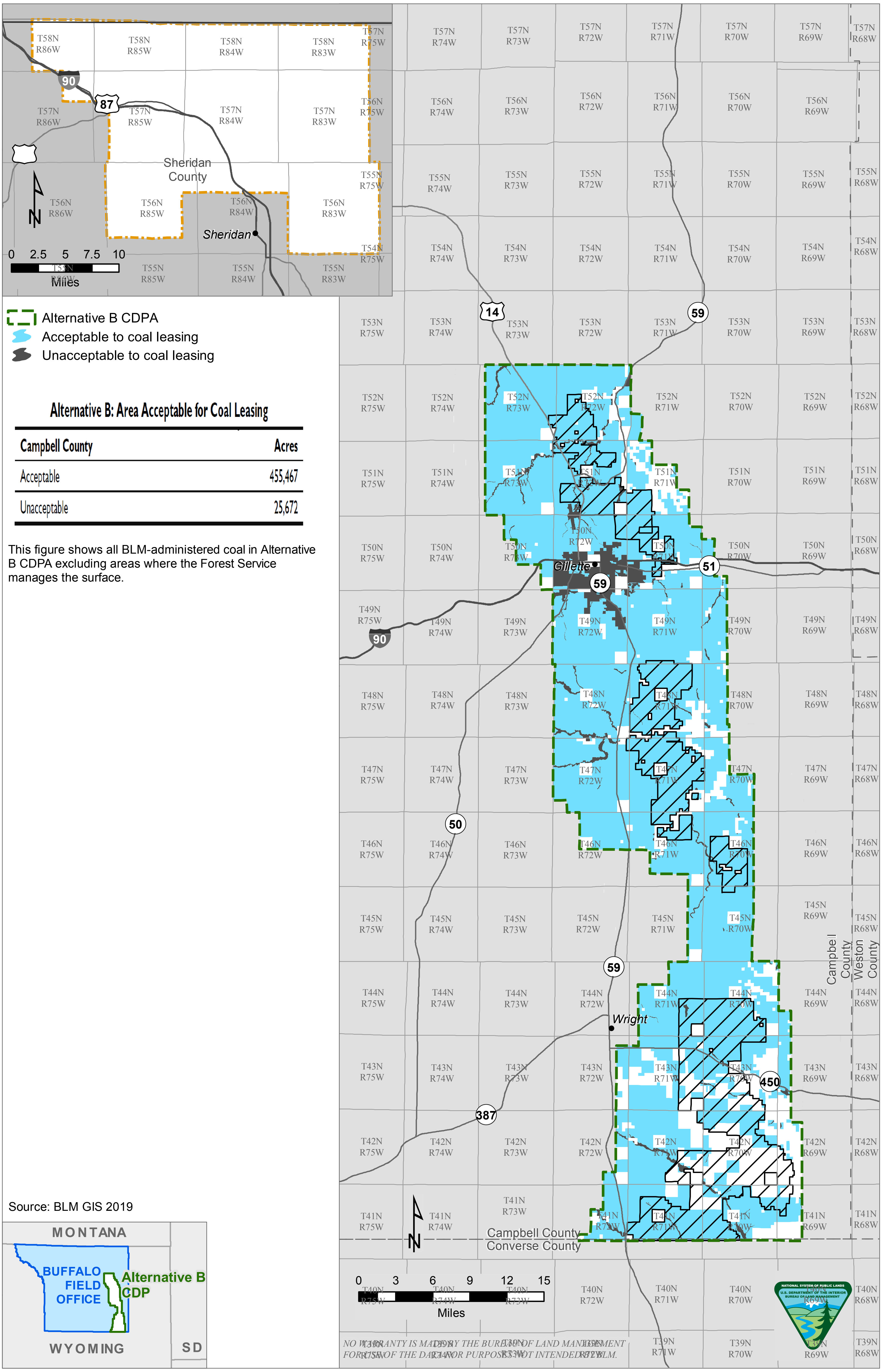
### Figure 2-2
### Alternative B



- Alternative B CDPA
- Acceptable to coal leasing
- Unacceptable to coal leasing

**Alternative B: Area Acceptable for Coal Leasing**

| Campbell County | Acres |
|---|---|
| Acceptable | 455,467 |
| Unacceptable | 25,672 |

This figure shows all BLM-administered coal in Alternative B CDPA excluding areas where the Forest Service manages the surface.

Source: BLM GIS 2019

NO WARRANTY IS MADE BY THE BUREAU OF LAND MANAGEMENT FOR USE OF THE DATA FOR PURPOSES NOT INTENDED BY BLM.

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### Table 2-4
### Coal Acceptability Results for Alternative B[1]

| Location[2] | Acceptable (Acres) | Unacceptable (Acres) |
|---|---|---|
| Campbell County | 455,467 | 25,672 |
| Sheridan County | 0 | 0 |
| **Total** | **455,467** | **25,672** |

Source: BLM GIS 2019

[1] Total volume: 52.2 tons

[2] Inside the CDPA

### 2.2.3 Reasonably Foreseeable Development

In the 2015 Proposed RMP/Final EIS, the BLM identified the 2009 coal production, which was when coal production peaked. Current assumptions, data, and projections for coal development are lower than identified in the 2015 document. The BLM developed an updated RFD scenario (see **Appendix B**) for this SEIS/RMPA that applies to both alternatives. On average, about 213 million tons of federal coal will be mined from the CDPA each year, totaling 4.2 billion tons of federal coal over the life of the SEIS/RMPA. An estimated 36,620 acres (based on current lease applications) would be disturbed over the life of the SEIS/RMPA.

### 2.2.4 Rationale for Identifying a Preferred Alternative

NEPA regulations require agencies to identify a preferred alternative, if one exists, in the draft EIS. Furthermore, BLM planning regulations at 43 CFR 1610.4-7 require identification of the preferred alternative in a draft EIS for an RMP.

The BLM Field Manager recommends Alternative B as the preferred alternative. During public review of this draft SEIS/RMPA, the BLM seeks constructive input on the proposals for managing coal leasing. After considering these comments, the BLM will develop the Final SEIS/RMPA.

### 2.2.5 Alternatives Considered but Eliminated from Further Study

NEPA requires federal agencies to rigorously explore and objectively evaluate all reasonable alternatives and to briefly discuss the reasons for eliminating any that were not developed in detail (40 CFR1502.14). Through their comments on the proposed action, the public suggested alternative methods for achieving the purpose and need.

#### *No Leasing Alternative*

During scoping, several commenters suggested analyzing a no leasing of future coal alternative. The BLM considered the suggestion of closing the decision area to any future leasing of federal coal resources, even in areas where there are no identified resource conflicts; however, the BLM did not bring it forward for further analysis.

According to the BLM Land Use Planning Handbook H-1601-1, Appendix C, the primary land use plan level decision to be made regarding coal is identifying areas that are acceptable for further consideration for coal leasing and those that are not. The process undertaken in order to make these land use plan allocations is directed by the CFR. In order to make the land use plan-level allocations regarding coal, the BLM is required to go through the coal screening process outlined in 43 CFR 3420 et. seq., versus applying a blanket no leasing alternative. During this coal screening process, the BLM analyzed all relevant resources when considering what areas to make acceptable for further consideration for coal leasing.

Making the entire decision area unacceptable for further consideration for coal leasing would not meet the BLM's multiple use mandate under FLPMA, the leasing requirements under the Mineral Leasing Act of 1920, as amended, and 43 CFR 3400.2. Coal development is an authorized use of public lands and meets the BLM's multiple use objectives. Three percent of the decision area, or 131,837 acres, has already been committed for leasing through issued leases; therefore, coal development in the decision area will continue, as these leases are subject to valid existing rights.

#### *Reduced Emissions Alternative*

The BLM considered reducing air emissions, as a nexus for climate change, under the multiple-use coal screen. Previous coal development in the BFO and emission inventories for the 2015 Proposed RMP/Final EIS complied with the State of Wyoming and National Ambient Air Quality Standards. Past production and the 2015 Proposed RMP/Final EIS modeling, which used 2009 production levels (417.8 million metric tons), were considerably higher than the 2018 production levels (293.4 million metric tons) and the US Energy Information Administration (EIA 2019) forecast analyzed in this SEIS/RMPA.

Since the 2015 Proposed RMP/Final EIS emissions met the State and Federal air quality standards, and the reasonably foreseeable development scenario for this SEIS/RMPA was lower than the 2015 data, the BLM considered an alternative that would reduce air emissions by limiting leasing to only areas immediately adjacent to the existing coal mines. This was done in order to consider the consolidation of the infrastructure used in the mining and transportation of the coal. However, the BFO determined that the supporting infrastructure is already consolidated and highly interconnected in the eastern half of Campbell County. In addition, it is highly unlikely, in eastern Campbell County, that a new coal mine would start and new infrastructure would be constructed within the next 20 years.

Because of these factors, this alternative was dismissed. The mines and the associated infrastructure in the BFO are highly consolidated, well developed, and interconnected so that some areas not immediately adjacent to, but between the mines, might be needed for future leasing. This was also not considered a feasible alternative because it could not be implemented without disrupting existing mining operations.

# Chapter 3. Affected Environment and Environmental Consequences

## 3.1 INTRODUCTION

This chapter describes the existing biological, physical, and socioeconomic characteristics of the Alternative A CDPA, including human uses that could be affected. It also evaluates the impacts of implementing the proposed alternatives. The 2015 Proposed RMP/Final EIS described the baseline conditions in the Alternative A CDPA (BLM 2015). Because that document described the baseline conditions in detail, this chapter incorporates those conditions by reference and provides descriptions of those resources that have new or updated information. **Chapter 1** of this SEIS/RMPA includes a list of those resources considered but eliminated from further analysis.

## 3.2 METHODS AND ASSUMPTIONS

### 3.2.1 Analytical Assumptions

The BLM made several assumptions to facilitate the analysis of potential effects and ensure that our analysis adhered to the court order. For most resources, it applied assumptions identified in the 2015 Proposed RMP/Final EIS.

What follows are general assumptions that apply to all resources:

- Planning issues identified in **Chapter 1** and the US District Court's opinion and order provide the focus for the scope of effects analyzed in this chapter.
- The life of the SEIS/RMPA is 20 years.
- The SEIS analysis area does not include the entire planning areas from the 2015 Proposed RMP/Final EIS. The analysis area for indirect effects associated with coal leasing is limited to the CDPA for each alternative (**Figure 3-1**). The RFD area is the analysis area for the indirect effects associated with coal mining during the planning period. It includes current leases, leases by application, and 141,762 acres (16.26 billion tons) of BLM-administered coal in Campbell County.
- Surface disturbance is estimated for all alternatives at 36,620 acres associated with federal coal in the RFD area (**Figure 3-1** and **Appendix B**).
- The geographical area of analysis for most resources is the Alternative A CDPA.
- There are no active lease actions or mines in Sheridan County; therefore, no effects are anticipated from coal development there.
- There are 4.9 billion tons of coal forecast for development in Campbell County over the 20-year planning period (see **Appendix B**); 4.2 billion tons are BLM-administered coal reserves.
- No new mine starts were analyzed. This is because new mine starts will require a separate EIS, due to the infrastructure requirement. At such time, the BLM would evaluate if an RMP amendment is required.
- The analysis includes surface mines and surface disturbance. There are no underground mines in the BFO.
- Mining will occur in the RFD area, and development is expected to move outward, to the west (**Figure 3-1**).

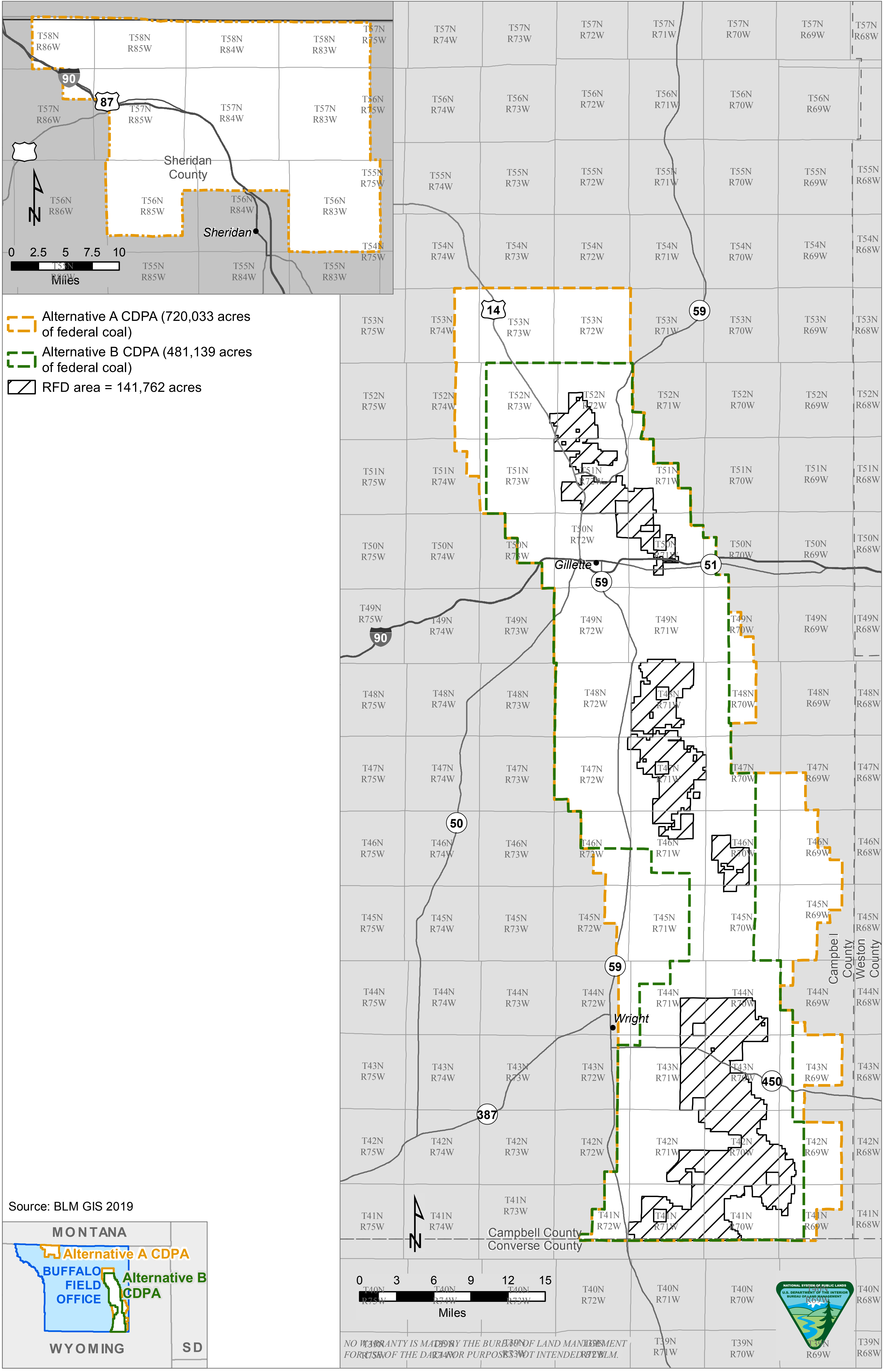
- An average of 19 to 20 years production are remaining on current leases, with fewer remaining reserves for the central and southern mines.
- Resources will be affected in proportion to the percent of resources in the RFD area.
- The BLM updated baseline data from the 2015 Proposed RMP/Final EIS where new information was available.
- The 2019 Greater Sage-Grouse amendment updates BLM Greater Sage-Grouse management to be more consistent with the State of Wyoming's Greater Sage-Grouse management policy (EO 2015-4; State of Wyoming 2015).
- Direct effects are caused by the planning decision to determine areas as acceptable or unacceptable for consideration for coal leasing.
- Indirect effects will be the result of foreseeable actions, including leasing and mining.
- Indirect effects from coal leasing and mining will be similar for all resources, as identified in the Wright Coal Lease Applications FEIS (BLM/WY/PL-10/022+1320; BLM 2010) and the South Gillette Area Coal Lease Applications FEIS (BLM/WY/PL-09/029+1320; BLM 2009). These FEISs are available on ePlanning.
- Reclamation standards for coal mining are outlined in the Surface Mining Control and Reclamation Act of 1977 and will apply to any surface mining activities.

## 3.3 RESOURCES ELIMINATED FROM FURTHER ANALYSIS

During the initial stages of planning for this SEIS/RMPA, the BLM identified four categories of resources/resource uses that fall under its NEPA handbook requirements:

1. Resources that do not fall within the Alternative A CDPA and are therefore dismissed from further analysis (see **Chapter 1** of this SEIS/RMPA)
2. Resources that are in the Alternative A CDPA but that were dismissed because they were determined to be unsuitable, without exception, for coal development, according to the unsuitability criteria, or because they conflicted in the multiple use coal screen, in accordance with 43 CFR 3420.1–4 (see **Chapter 1** of this SEIS/RMPA)
3. Resources in the Alternative A CDPA are acceptable for further consideration for leasing; impacts on these resources would be the same as identified in the 2015 Proposed RMP/Final EIS, but they would take place only in the Alternative A CDPA (see **Table 3-1**, below)
4. Resources that would have different impacts, based on the RFD, coal screening analysis, and updated data; areas analyzed in detail in **Sections 3.5.1** through **3.5.3** of this SEIS/RMPA are air resources including greenhouse gases (GHGs) and climate change, economic considerations, and biological resources

**Figure 3-1**
**Coal Development Potential and Reasonably Foreseeable Development Area**



Source: BLM GIS 2019

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## Table 3-1
## SEIS/RMPA Resources with the Same Indirect and Cumulative Impacts Identified in the 2015 Proposed RMP/Final EIS and Indirect Impacts in the 2011 Wright FEIS (BLM 2010)[1]

| Resource | Resource Indicator | Alternative A CDPA (acres) | | | Alternative B CDPA (acres) |
|---|---|---|---|---|---|
| | | Sheridan County | Campbell County | Total | Campbell County Only |
| **Soils**<br>See Section 4.1.3 of the 2015 RMP/Final EIS (BLM 2015)<br>See Section 3.8.2 of the Wright FEIS (BLM 2010) | Severe erosion (wind and water) | 25,400 | 89,660 | 115,060 | 46,600 |
| | Slopes greater than 25 percent | 6,960 | 12,270 | 20,230 | 6,290 |
| | Poor reclamation suitability | 39,260 | 262,840 | 302,100 | 171,740 |
| | Low reclamation potential | 11,263 | 71,445 | 82,208 | 35,439 |
| **Water Resources**<br>See Section 4.1.4 of the 2015 RMP/Final EIS (BLM 2015)<br>See Sections 3.5.1.2 and 3.5.2.2 of the Wright FEIS (BLM 2010) | Surface waters | 4,130 | 26,220 | 30,350 | 21,170 |
| | Alluvial valley floors | 3,500 | 14,627 | 18,127 | 12,348 |
| | Groundwater wells | 152 | 1,076 | 1,228 | 1,009 |
| **Vegetation**<br>See Sections 4.4.1, 4.4.2, 4.4.3, and 4.4.4 of the 2015 RMP/Final EIS (BLM 2015).<br>See Section 3.9.2 of the Wright FEIS (BLM 2010). | Agricultural | 1,290 | 530 | 1,820 | 520 |
| | Barren | 790 | 10,730 | 11,520 | 8,820 |
| | Short-grass prairie | 19,220 | 273,790 | 293,010 | 209,740 |
| | Mixed-grass prairie | 32,010 | 73,340 | 105,350 | 58,140 |
| | Sagebrush | 15,120 | 280,080 | 295,200 | 199,000 |
| | Riparian | 210 | 380 | 590 | 340 |
| | Conifer forest | 960 | 3,690 | 4,650 | 1,400 |
| | Wet meadow | 2,290 | 2,370 | 4,660 | 2,200 |
| | Water | 100 | 1,060 | 1,160 | 990 |
| | Other/no record | 0 | 770 | 770 | 0 |
| **Cultural Resources**<br>See Section 4.5.1 of the 2015 RMP/Final EIS (BLM 2015)<br>See Section 3.12.2 of the Wright FEIS (BLM 2010) | Known resources | 231 | 3,516 | 3,747 | 2,573 |
| | Eligible for listing on the NRHP | 7 | 439 | 446 | 290 |
| | Not eligible for listing on the NRHP | 113 | 2460 | 2573 | 2054 |
| | Not evaluated | 111 | 344 | 455 | 229 |
| | Known Native American features | 25 | 416 | 441 | 277 |
| **Paleontological Resources**<br>See Section 4.5.2 of the 2015 RMP/Final EIS (BLM 2015)<br>See Section 3.3.3.2 of the Wright FEIS (BLM 2010) | PFYC Class 2 Areas | 2,050 | 15,790 | 17,840 | 12,940 |
| | PFYC Class 3 Areas | 44,090 | 193,900 | 237,990 | 98,280 |
| | PFYC Class 3A Areas | 27,070 | 437,050 | 464,120 | 369,920 |

| Resource | Resource Indicator | Alternative A CDPA (acres) | | | Alternative B CDPA (acres) |
|---|---|---|---|---|---|
| | | Sheridan County | Campbell County | Total | Campbell County Only |
| **Visual Resources**<br>See Section 4.5.3 of the 2015 RMP/Final EIS (BLM 2015)<br>See Section 3.13.2 of the Wright FEIS (BLM 2010) | VRM Class II | 1,820 | 250 | 2,070 | 210 |
| | VRM Class III | 1,690 | 1,900 | 3,590 | 140 |
| | VRM Class IV | 440 | 22,700 | 23,140 | 4,610 |
| **Lands and Realty**<br>See Section 4.6.2 of the 2015 RMP/Final EIS (BLM 2015)<br>See Section 3.11.2 of the Wright FEIS (BLM 2010) | Rights-of-way (ROW) Linear | 19 | 237 | 256 | 117 |
| | ROW – Non-linear | 0 | 280 | 280 | 204 |
| | Agency Roads | 0 | 18 | 46 | 12 |
| | Buildings | 403 | 17,608 | 18,011 | 17,244 |
| | Cemeteries | 0 | 315 | 315 | 315 |
| | Cities | 0 | 13,289 | 13,289 | 13,290 |
| | County Roads | 337 | 2,383 | 2,720 | 2,033 |
| | Interstates | 166 | 467 | 633 | 466 |
| | State Highways | 86 | 855 | 941 | 773 |
| | US Highways | 98 | 415 | 513 | 339 |
| | Agency Roads | 0 | 18 | 18 | 12 |

Sources: BLM GIS 2019; WGFD GIS Data 2018; BLM 2019 memorandum to Tom Bills, BLM BFO from GL "Buck" Damone III, Lead Archaeologist, Buffalo Field Office, February 12.

[1] Calculations include non-federal lands, current lease actions, and areas already mined outside of current leases.

## 3.4 CUMULATIVE IMPACTS

### 3.4.1 Cumulative Analysis Method

Cumulative impacts are those impacts on the environment that result from implementing either of the alternatives, in combination with other actions outside the scope of this SEIS/RMPA. CEQ (1997) regulations require a cumulative impact analysis because environmental conditions result from many different factors that act together. The total effect of any single action cannot be determined by considering it in isolation; it must be determined by considering the likely result of that action, in conjunction with many other actions.

### 3.4.2 Past, Present, and Reasonably Foreseeable Future Actions

Evaluating potential impacts includes considering incremental impacts that could occur from the alternatives, as well as impacts from past, present, and reasonably foreseeable future actions (RFFAs). The RFFA area is fully contained in the area determined acceptable for further consideration for leasing in the 2015 Proposed RMP/Final EIS. See Appendix G of that document for a list of reasonably foreseeable actions in the RFFA.

## 3.5 RESOURCES BROUGHT FORWARD FOR ANALYSIS

### 3.5.1 Air Resources, including Greenhouse Gases and Climate Change

The BLM air resources program includes air quality, air quality related values such as visibility and deposition, and greenhouse gases and climate change. Because the management actions being evaluated in this SEIS would not affect the air quality and air quality related values analyses contained in the 2015 Proposed RMP/Final EIS (BLM 2015) and these were not the subject of the court order, the analysis here focuses on greenhouse gases and climate change.

### *Affected Environment*

This section incorporates by reference the affected environment described in the 2015 Proposed RMP/Final EIS (Section 3.1.1.6, Climate Change, pp. 318–324). More recent information as it pertains to the decisions for this SEIS/RMPA is included below.

The Intergovernmental Panel on Climate Change (IPCC) defines climate change as "a change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties, and persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forcing such as modulations of the solar cycles, volcanic eruptions and persistent anthropogenic changes in the composition of the atmosphere or in land use" (IPCC 2013).

The IPCC states: "Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, sea level has risen, and the concentrations of greenhouse gases have increased" (IPCC 2013). The global average surface temperature has increased approximately 1.5 degrees Fahrenheit (°F) from 1880 to 2012 (IPCC 2013). Warming has occurred on land surfaces, oceans and other water bodies, and in the troposphere, which is the lowest layer of earth's atmosphere, ranging from 4 to 12 miles above the surface. The troposphere is where all the weather phenomena we experience on a daily basis occurs.

Current ongoing global climate change is caused, in part, by the atmospheric buildup of greenhouse gases (GHGs), which may persist for decades or even centuries. Although largely invisible to the short wavelength incoming solar radiation that heats the earth's surface, GHGs absorb a portion of the outgoing long wavelength infrared heat radiated back from the surface; this prevents it from escaping into space. As a result, the buildup of GHGs, such as carbon dioxide, methane, and nitrous oxide, since the start of the Industrial Revolution has increased the global mean temperature and begun to alter the earth's climate in complex ways.

This section analyzes the three main GHGs (carbon dioxide [$CO_2$], nitrous oxide [$N_2O$], and methane [$CH_4$]) associated with the production, transportation, and downstream combustion of coal, oil, and gas over the life of the Buffalo Field Office SEIS/RMPA. The analysis responds to the GHG and climate change-related issues identified in the United States District Court, District of Montana, opinion and order (*Western Organization of Resource Councils, et al. vs. BLM*) and issues identified through scoping. These issues are identified in **Chapter 1**, Purpose and Need, and in **Table 1-1**, Scoping Issues and the Resource Topics Affected. The court order requires the BLM to supplement the 2015 Proposed RMP/Final EIS analysis to evaluate the environmental consequences of the downstream combustion of coal, oil, and gas open to potential development (claim #3), to justify the use of global warming potential (GWP) time horizons, and to explain the evolving science in this area (claim #5).

The method the BLM used to supplement the GHG and climate change analysis accordingly is described below. **Section 2.2**, Alternatives Development, addresses coal screening and consideration of climate change impacts used to make a reasoned decision on the amount of recoverable coal acceptable for further consideration for leasing in this RMP (claim #1).

Different GHGs have different atmospheric lifetimes; some, such as methane, react in the atmosphere relatively quickly, on the order of 12 years (see EPA 2018a), whereas others, such as carbon dioxide typically last for hundreds of years or longer. GHGs also vary with respect to the amount of outgoing radiation absorbed by each gas molecule, relative to the amount of incoming radiation it allows to pass through, that is, its level of radiative forcing. A molecule of nitrous oxide is far more effective at absorbing outgoing radiation than a molecule of $CO_2$.

The impact of a given GHG species on global warming depends both on its radiative forcing and how long it lasts in the atmosphere. Climate scientists have calculated a GWP for each GHG that accounts for these effects. GWPs are calculated for each GHG species for a specified time interval, typically 20 or 100 years. By definition, the GWP for $CO_2$ is assigned a value of 1, and GWPs for other gases are defined relative to $CO_2$. In technical terms, GWP is the time-integrated direct (and potentially indirect) radiative forcing of an amount of a GHG species released instantaneously into the atmosphere, relative to that of an equal amount of $CO_2$.

GWP values allow for direct comparison of the impacts of emissions of different GHGs. In particular, emissions of mixtures of different GHGs are typically summarized in terms of their $CO_2$ equivalent ($CO_2e$) emissions, defined as the weighted sum of the emissions of each GHG, where the weights are the GWPs. For example, emissions of the three most significant GHGs associated with fossil fuel combustion ($CO_2$, $CH_4$, and $N_2O$) are summarized as:

$$CO_2e\ (MMT/yr) = CO_2(MMT/yr) + GWP_{CH4} \times CH_4(MMT/yr) + GWP_{N2O} \times N_2O(MMT/yr)$$

where MMT stands for million metric tons.

Because the GWP of a given GHG depends in part on the atmospheric lifetime of the GHG, GWP values depend on the time interval for which they are estimated. The GWP for a relatively short-lived GHG, such as $CH_4$, is larger over a short period, say, 20 years, compared with a much longer period, such as 100 years. This is because most of the $CH_4$ will have reacted away well before 100 years have passed. Conversely, long-lived GHGs have a 20-year GWP that is lower than the 100-year GWP. This is because the time integrated radiative forcing is less (relative to $CO_2$) over the shorter time interval.

As a result of various complex feedbacks in the earth-atmosphere system, GWPs can only be roughly estimated; according to the IPCC (2013), GWPs typically have an uncertainty of ±35 percent. Estimates of GWPs have been updated over the years as the models used to calculate them have been refined. The updated estimates also reflect the changing composition of the atmosphere, which affects the GWP of each additional ton of GHG emissions.

GWPs have been calculated for several GHGs over different time horizons, including 20 years, 100 years, and 500 years. The choice of time horizon depends on the type of application and policy context; hence, no single time horizon is optimal for all policy goals. The United Nations Framework Convention on Climate Change and its Kyoto Protocol[1] adopted the 100-year GWP, which is used widely as the default metric. The US Environmental Protection Agency (EPA) uses the 100-year time horizon in its annual GHG inventories; the EPA's most recent inventory (2019a) uses 100-year GWPs consistent with the IPCC Fifth Assessment Report.

For this SEIS/RMPA, the BLM reports $CO_2e$ emissions using GWPs for the 100-year time horizon. This was done for consistency with the EPA's inventory. It also reports $CO_2e$ emissions using GWPs for the 20-year time horizon to more clearly estimate the relative impacts of shorter lived GHGs, such as $CH_4$, over the 20-

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[1] https://unfccc.int

year life of the RMP. More information on specific GWPs and time horizons used for this SEIS/RMPA analysis is in the section below on *Direct and Indirect Impacts*, *Analysis Methods*.

*Physical Manifestations of Climate Change*

Warming of the earth's climate since the Industrial Revolution has been observed to coincide with widespread effects throughout the earth-atmosphere system, including reductions in extent and duration of polar sea ice and mountain winter snowpack, rising sea levels, increases in mean nighttime minimum temperatures, shifts in historical rainfall patterns, and changes in the frequency, severity, and duration of extreme weather events. These effects in turn have affected natural and human systems, regardless of cause, implicating the sensitivity of natural and human systems to changing climate (IPCC 2013).

The potential effects of climate change, as reported in the Northwestern Plains Rapid Ecoregional Assessment and the Third National Climate Assessment (NCA; published in 2014), were described in the 2015 Proposed RMP/Final EIS (Section 3.1.1.6, Climate Change, pp. 318–321). The Fourth NCA was published in November 2018. It was written to help inform decision-makers, utility and natural resource managers, public health officials, emergency planners, and other stakeholders by providing a thorough examination of the effects of climate change in the United States (USGCRP 2016). The National Oceanic and Atmospheric Administration summarizes some of the key findings of the report by stating that the US is increasingly vulnerable to climate change and, while societal responses to climate change have expanded, they are not yet at the scale needed to avoid substantial impacts (NOAA 2018). Compared with previous reports, the Fourth NCA provides greater detail on regional scales. This is because impacts and adaptation tend to be realized at a more local level.

As reported in the Fourth NCA, climate model projections show a warmer future in the northern Great Plains (Montana, Wyoming, North Dakota, South Dakota, and Nebraska), with conditions becoming consistently warmer in 2 to 3 decades and temperatures rising steadily toward the middle of the century, irrespective of the climate scenario modeled. The Fourth NCA relies on recent climate modeling scenarios, developed by the integrated assessment modeling community and known as the representative concentration pathways (RCP). The lower scenario assumes lower emissions and concentrations of GHGs and aerosols and projects a lower change in radiative forcing by 2100. The higher scenario assumes a continued dependence on fossil fuels and higher GHG emissions and concentrations; it projects a larger change in radiative forcing by 2100.

For the Northern Great Plains, the Fourth NCA reports that temperature increases of 2°F to 4°F projected by 2050 under the lower scenario are expected to increase the occurrence of both drought and heat waves; these projected trends would be greater under the higher scenario. The probability for more hot days, with maximum temperatures above 90°F, is expected to increase. There are projected to be many fewer cool days, with minimum temperatures less than 28°F, which will decrease by 30 days or more per year by mid-century.

The amount, distribution, and variability of annual precipitation are anticipated to change, with increases in winter and spring precipitation of 10 to 30 percent by the end of this century and a decrease in the amount of precipitation falling as snow under a higher scenario. Summer precipitation is expected to vary across the northern Great Plains, ranging from no change under a lower scenario to 10 to 20 percent reductions under a higher scenario. Further, the frequency of heavy precipitation events is projected to increase by about 50 percent in the frequency of 2-day heavy rainfall events by 2050 under the higher scenario. The amount falling in single day heavy events is projected to increase by 8 to 10 percent by mid-century, depending on the scenario. While there is high confidence in future increases in temperature, uncertainties exist as to the degree of precipitation variability from year to year and within season (Conant et al. 2018).

*Greenhouse Gas Emissions in Context*

GHG emissions are reported at a number of spatial scales, including globally, nationally, and at the state level. In addition to these scales (described under *Direct and Indirect Impacts*, *Analysis Methods* for the emission scales used for this analysis), GHG emissions from fossil fuels produced on federal lands and emissions reported in the three planning area counties are described below. A comparison of GHG emissions at differing scales provides context against which to compare emissions from a specific action, such as that evaluated in this SEIS/RMPA.

The US Geological Survey (2018) published a report on GHG emissions from extraction and use of fossil fuels produced on federal lands and GHG sinks (carbon storage by terrestrial ecosystems) on federal lands in the US. In 2014, nationwide emissions from oil, gas, and coal extracted from federal lands were 1,279.0 million metric tons (MMT) $CO_2e$ of carbon dioxide, 47.6 MMT $CO_2e$ of methane, and 5.5 MMT $CO_2e$ of nitrous oxide, based on 100-year GWPs. GHG emissions from production and combustion of fossil fuels produced on federal lands in Wyoming were 727.7 MMT $CO_2e$ of carbon dioxide (this is 57 percent of total carbon dioxide emissions from all states and offshore areas combined) and 13.1 MMT $CO_2e$ of methane (this is 28 percent of total methane emissions from all states and offshore areas combined) (USGS 2018). Wyoming had the highest percentage of carbon dioxide and methane emissions from fuels produced on federal lands of all states and offshore regions (USGS 2018).

In 2014, carbon storage by terrestrial ecosystems on federal lands in the conterminous United States (not including Alaska and Hawaii) was 83,600 MMT $CO_2e$. Soils stored 63 percent of carbon, with vegetation and dead organic matter storing 26 percent and 11 percent, respectively. Between 2005 and 2014, the annual rate of net carbon uptake by terrestrial ecosystems in the conterminous US ranged from a sink (sequestration) of 475 MMT tons of $CO_2e$ per year to a source (emission) of 51 MMT $CO_2e$ per year. This was due to such factors as changes in climate and weather, land use, land cover change, and wildfire frequency. Terrestrial ecosystems on federal lands sequestered an average of 195 MMT $CO_2e$ per year nationally between 2005 and 2014. In Wyoming, the annual average sequestration over the 10-year period was 10 MMT $CO_2e$. The 2014 net emissions of GHG for federal lands in Wyoming were 701.5 MMT $CO_2e$ per year, indicating that more GHGs were emitted than were sequestered. This was the largest net emissions of any state by a factor of 10 (USGS 2018).

In its facility level information on greenhouse gases tool (FLIGHT), the EPA (2018b) reports annual GHG emissions from facilities emitting more than 25,000 metric tons of $CO_2e$ that are subject to the EPA's Greenhouse Gas Reporting Program (GHGRP) under 40 CFR Part 98. This includes emissions from most large stationary sources of GHGs (smaller emitters are not required to report) and emissions from most end uses of fossil fuels. Nationally, the GHGRP accounts for 85 to 90 percent of total GHG emissions in the EPA's *Inventory of US Greenhouse Gas Emissions and* Sinks.[2] While $CH_4$ emissions from underground coal mines are included in the GHGRP, emissions from coal strip mines are not. GHG emissions reported under GHGRP by facilities in the three planning area counties for 2010 to 2017 are shown in **Figure 3-2**. Nearly all of the reported emissions for Campbell County are from coal-fired power plants, while all of the reported emissions in Johnson County are from petroleum and natural gas systems. Reported emissions in Sheridan County are negligible, compared with Campbell and Johnson Counties.

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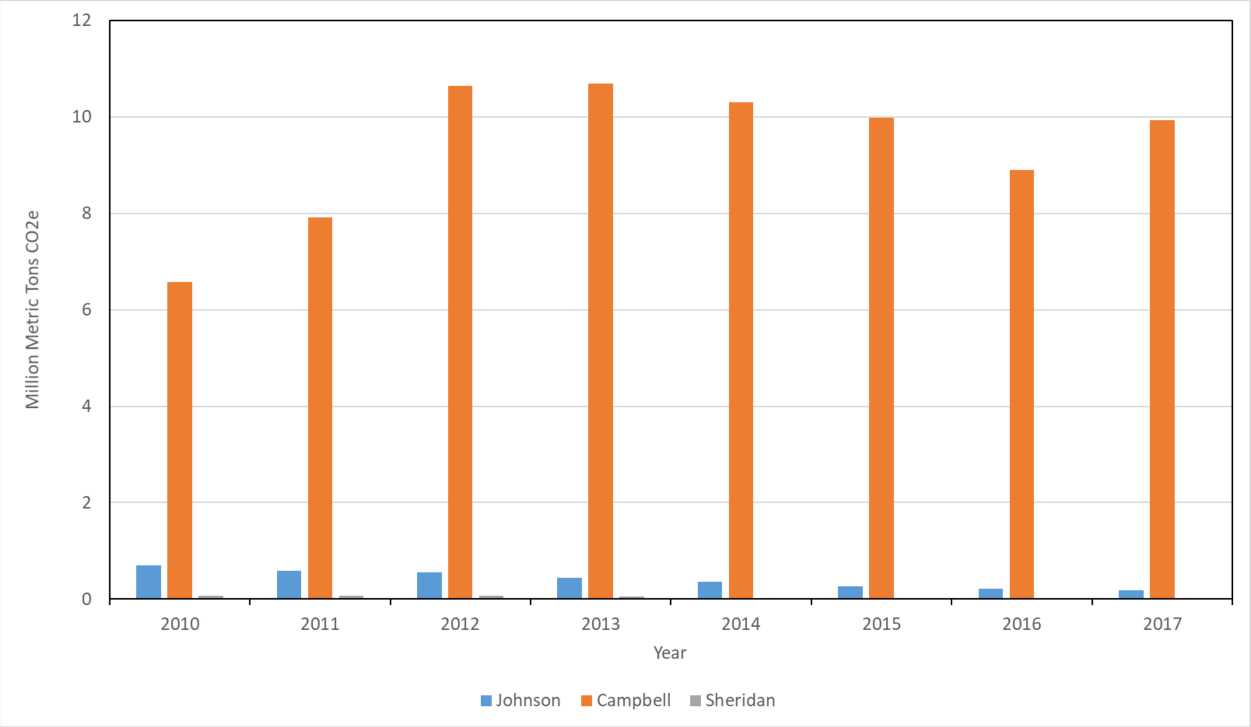
[2] https://www3.epa.gov/climatechange/ghgemissions/inventoryexplorer/data_explorer_flight.html

**Figure 3-2. GHG Emissions in the Three Planning Area Counties (EPA 2018b)**



### *Direct and Indirect Impacts*

*Analysis Methods*

This section analyzes the three main GHGs—carbon dioxide, nitrous oxide, and methane—associated with the production, transportation, and downstream combustion of coal, oil, and gas over the life of the Buffalo Field Office SEIS/RMPA. The analysis responds to the GHG and climate change-related issues identified in the United States District Court, District of Montana, opinion and order (*Western Organization of Resource Councils, et al. vs. BLM*) and issues identified through scoping. Details of the method used to supplement the GHG and climate change analysis with regard to claim #3 and claim #5 of the court's decision are described below. Coal screening and consideration of climate change impacts used to make a reasoned decision on the amount of recoverable coal acceptable for further consideration for leasing in the SEIS/RMP (claim #1) is addressed in **Section 2.2**, Alternatives Development.

**Coal.** Emissions of GHGs are quantified for the estimated future production, transportation, and downstream combustion of federal coal developed within the planning area over the life of the plan. GHG emissions for coal production on federal lands are calculated from the default coal methane emissions factor for surface mines in EPA's *State Inventory and Projection Tool*[3] for Wyoming and the BLM RFD forecast for 2019–2038 (**Appendix B**).

Transportation emissions are estimated for the transport of produced coal via rail using diesel locomotives. An average one-way train haul distance of 1,115 miles was assumed and emissions were calculated using the RFD-predicted annual tons of coal and two one-way trips per ton of coal. The production-weighted average train haul distance in miles was estimated by using 2017 coal transport data for the Powder River Basin,

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[3] https://www.epa.gov/statelocalenergy/state-inventory-and-projection-tool

Wyoming, obtained from the US Energy Information Administration (EIA) Coal Data Browser (EIA 2019a). Locomotive fuel consumption rates and GHG emission factors used to calculate GHG coal transportation emissions are developed for trains hauling coal and the return trip hauling empty cars. To account for the reduced load on the return trip, when the coal cars are typically empty, fuel consumption is estimated at 21.8 percent of the outbound (loaded) fuel consumption, based on the ratio of the total weight of the unloaded train to that of the loaded train (AAR 2018; BNSF 2019; Union Pacific 2019).

The calculations for trains hauling coal are based on emission factors developed from the Burlington Northern Santa Fe (BNSF) Railway and EPA. BNSF developed a fuel efficiency factor for diesel locomotives of 849 ton-miles per gallon in its 2017 Corporate Responsibility and Sustainability Report (BNSF 2017). The EPA provided emission factors for diesel locomotives of 20.9 pounds per gallon for $CO_2$, 0.0018 pounds per gallon for $CH_4$, and 0.0006 pounds per gallon for $N_2O$, as presented in the Greenhouse Gas Inventory Guidance, Direct Emissions from Mobile Combustion Sources (EPA 2016).

Downstream emissions from federal coal combustion are determined as per claim #3 using GHG emissions factors for stationary combustion of sub-bituminous coal from the EPA Emission Factors for Greenhouse Gas Inventories (EPA 2018c). The emission factors used for $CO_2$, $CH_4$, and $N_2O$ are 1,676 kilograms per short ton, 190 kilograms per short ton, and 28 kilograms per short ton, respectively.

The GHG emissions for production, transportation, and downstream combustion are the same under Alternative A (No Action Alternative) and Alternative B (the action alternative). This is because the same RFD is used in both alternatives.

GHG emissions are adjusted to use GWP values based on both 20- and 100-year time horizons to calculate carbon dioxide equivalents (see **Table 3-2** for a description of the GWPs and scientific relevance of these two time horizons). The 100-year GWPs were selected so that emissions reported here can be directly compared with emissions inventories compiled by the EPA (2019a), which use these same GWPs, and to evaluate the relative long-term effect of emissions. The 20-year GWPs were selected to better evaluate near-term impacts of methane emissions over the life of the SEIS/RMP (see discussion under *Affected Environment*, above). GWPs for other time horizons are not readily available and are not commonly used in the climate change community.

**Table 3-2**
**GWPs for 100-Year and 20-Year Time Horizons and Rationale**

| Time Horizon | GWP | | | Rationale |
|---|---|---|---|---|
| | $CO_2$ | $CH_4$ | $N_2O$ | |
| 100-Year | 1 | 28 | 265 | Adopted by the United Nations Framework Convention on Climate Change and its Kyoto Protocol and used widely as the default metric; used by EPA in its GHG Inventories and GHG Reporting Rule requirements under 40 CFR 98A; consistent with the IPCC Fifth Assessment Report in its science communications. |
| 20-Year | 1 | 84 | 264 | Prioritizes gases with shorter lifetimes, such as $CH_4$, because it does not consider impacts that happen more than 20 years after the emissions occur. Because all GWPs are calculated relative to $CO_2$, GWPs based on a shorter time frame will be larger for gases with lifetimes shorter than that of $CO_2$ and will be smaller for gases with lifetimes longer than $CO_2$. |

Source: IPCC 2014

Other emissions weighting metrics, such as the global temperature change potential (IPCC 2013), are not commonly used for reporting GHG emissions. Evaluations of the relative importance of emissions of short-lived GHG species relative to $CO_2$ are sensitive to the particular metric used, which should be carefully selected to match the specific policy question being addressed.

The state, national, and global emissions totals of GHGs (see **Table 3-3**) are reported for comparison with the potential direct and indirect impacts of coal mining on BFO federal lands. A comparison with other metrics is provided for additional context.

**Table 3-3**
**GHG Emissions at Various Scales**

| Spatial Scale (Year) | GHG Emissions | Source |
|---|---|---|
| Wyoming (2017) | 60.4 MMT $CO_2$e per year | EPA 2018b |
| National (2017) | 6,457 MMT $CO_2$e per year | EPA 2019a |
| Global (2010) | 52 gigatonne* per year | IPCC 2014 |

* one gigatonne=a thousand million metric tons

**Oil and Gas.** GHG emissions are quantified for production and downstream combustion of oil, conventional natural gas, and coal bed natural gas (CBNG). The annual production estimates for 2019–2030 are the same as the fluid minerals production forecast for Alternative D in the 2015 Proposed RMP/Final EIS (BLM 2015) and are set equal to the 2030 forecast for years 2031–2038.

Conventional natural gas and CBNG GHG emissions listed in the 2015 Proposed RMP/Final EIS for 2015 and 2024 are each divided by total gas production in 2015 and 2024, respectively. This is done to derive separate GHG emission factors for conventional natural gas and CBNG. Total gas production is used because separate conventional natural gas and CBNG production volumes were not included in the 2015 Proposed RMP/Final EIS. These conventional natural gas and CBNG GHG emission factors are then applied to the estimated total gas production for each year in the RFD to derive separate annual conventional natural gas and CBNG emissions.

To account for differences in emissions factors between 2015 and 2024, emissions for 2019–2023 are based on the linear interpolation of the 2015 and 2024 emissions factors; emissions for 2024–2038 are based on the 2024 emissions factors. GWP values that reflect 20- and 100-year time horizons (see **Table 3-2**) are used to obtain $CO_2$e emissions.

Annual oil and gas production estimates are also used to form the basis of the emissions estimates for downstream combustion of oil and gas. Oil and gas combustion emissions are quantified using the EPA GHG emissions factors for stationary source combustion of No. 2 fuel oil and natural gas. GHG emissions due to transportation of oil and gas from the planning area are qualitatively assessed.

The GHG emissions quantified for production and downstream combustion are the same under Alternative A (the No Action Alternative) and Alternative B (the action alternative) because the same RFD is used for both. GHG emissions are reported using both 100-year and 20-year GWPs for reasons noted in the above discussion of coal (claim #5). State, national, and global emissions totals of GHGs from the EPA FLIGHT data (2018b), the EIA 2019 Annual Energy Outlook (2019a), and the IPCC Fifth Assessment Report (2014) are reported for comparison with the potential direct and indirect impacts of oil and gas development and production from federal minerals in the planning area (see **Table 3-3**). A comparison with other metrics is provided for additional context.

Assumptions

- Coal production values for each alternative are based on 2018 coal production and EIA 2019 coal production forecasts for average of high and low economic growth scenarios for Wyoming Powder River Basin low-sulfur sub-bituminous coal production (**Appendix B**).
- Coal will be transported one way by diesel locomotive rail over an average transportation distance of 1,115 miles; the distance was calculated using the EIA 2017 coal distribution from Wyoming.
- Fuel consumption to return empty coal railcars is 21.8 percent of the outbound loaded fuel consumption.
- All future coal produced is combusted in US energy generating units.
- Oil and gas production rates are based on the 2015 Proposed RMP/Final EIS, Alternative D (BLM 2015).

Indicators

- MMT of $CO_2$, $CH_4$, and $N_2O$ and the resulting $CO_2e$ from coal production, transportation, and downstream combustion over the life of the RMP
- MMT of $CO_2$, $CH_4$, and $N_2O$ and resulting $CO_2e$ from oil and gas production, and downstream combustion over the life of the RMP
- GHG emissions from coal, oil, and gas as a percentage of state, national, and global emissions and other metrics
- GHG emission equivalencies from power plants and wind turbines

*Impacts Common to all Alternatives*

Coal

**Table 3-4** summarizes GHG emissions from federal coal production, transportation, and downstream combustion for each forecast year. The details by pollutant ($CO_2$, $CH_4$, and $N_2O$) are shown in **Appendix C**.

**Table 3-4**
**GHG Emissions as CO2e from Federal Coal Production, Transportation, and Downstream Combustion, Based on 20-Year and 100-Year GWPs**

| Year | Federal RFD Coal Production Rate (MMst)[1] | $CO_2e$ (MMT[2], 20-Year GWP) | | | | $CO_2e$ (MMT[2], 100-Year GWP) | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Production | Transportation | Combustion | Total | Production | Transportation | Combustion | Total |
| 2019 | 258.6 | 19.11 | 3.98 | 439.51 | 462.60 | 6.37 | 3.96 | 436.76 | 447.09 |
| 2020 | 225.8 | 16.68 | 3.47 | 383.64 | 403.80 | 5.05 | 3.46 | 381.24 | 389.74 |
| 2021 | 217.7 | 16.09 | 3.35 | 369.96 | 389.40 | 4.87 | 3.33 | 367.64 | 375.84 |
| 2022 | 204.7 | 15.13 | 3.15 | 347.88 | 366.16 | 4.57 | 3.14 | 345.71 | 353.42 |
| 2023 | 201.2 | 14.87 | 3.10 | 341.89 | 359.85 | 4.50 | 3.08 | 339.75 | 347.33 |
| 2024 | 204.4 | 15.10 | 3.15 | 347.32 | 365.57 | 4.57 | 3.13 | 345.16 | 352.86 |
| 2025 | 204.7 | 15.13 | 3.15 | 347.94 | 366.22 | 4.58 | 3.14 | 345.76 | 353.47 |
| 2026 | 208.1 | 15.38 | 3.20 | 353.65 | 372.23 | 4.65 | 3.19 | 351.45 | 359.29 |
| 2027 | 204.1 | 15.08 | 3.14 | 346.84 | 365.06 | 4.56 | 3.13 | 344.67 | 352.36 |
| 2028 | 203.4 | 15.03 | 3.13 | 345.69 | 363.85 | 4.55 | 3.12 | 343.53 | 351.19 |

| Year | Federal RFD Coal Production Rate (MMst)[1] | $CO_2$e (MMT[2], 20-Year GWP) | | | | $CO_2$e (MMT[2], 100-Year GWP) | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Production | Transportation | Combustion | Total | Production | Transportation | Combustion | Total |
| 2029 | 213.4 | 15.77 | 3.28 | 362.61 | 381.66 | 4.77 | 3.27 | 360.34 | 368.38 |
| 2030 | 221.0 | 16.33 | 3.40 | 375.5 | 395.23 | 4.94 | 3.38 | 373.15 | 381.47 |
| 2031 | 218.0 | 16.11 | 3.35 | 370.42 | 389.88 | 4.87 | 3.34 | 368.11 | 376.32 |
| 2032 | 214.3 | 15.84 | 3.30 | 364.22 | 383.36 | 4.79 | 3.28 | 361.95 | 370.02 |
| 2033 | 211.8 | 15.65 | 3.26 | 359.87 | 378.78 | 4.73 | 3.24 | 357.62 | 365.60 |
| 2034 | 211.5 | 15.63 | 3.26 | 359.45 | 378.34 | 4.73 | 3.24 | 357.20 | 365.17 |
| 2035 | 209.9 | 15.52 | 3.23 | 356.77 | 375.52 | 4.69 | 3.22 | 354.54 | 362.45 |
| 2036 | 210.3 | 15.54 | 3.24 | 357.37 | 376.15 | 4.70 | 3.22 | 355.14 | 363.06 |
| 2037 | 208.9 | 15.44 | 3.21 | 354.95 | 373.60 | 4.67 | 3.20 | 352.73 | 360.60 |
| 2038 | 207.7 | 15.35 | 3.20 | 352.87 | 371.41 | 4.64 | 3.18 | 350.67 | 358.49 |
| **Total** | **4,259** | **314.8** | **65.6** | **7,238.4** | **7,618.8** | **95.8** | **65.2** | **7,193.1** | **7,354.1** |
| **Average** | **213.0** | **15.7** | **3.3** | **361.9** | **398.9** | **4.8** | **3.3** | **359.7** | **367.7** |

Source: Ramboll 2019

[1] MMst: million short tons

[2] MMT: million metric tons

The GHG emissions discussed above would contribute incrementally to global climate change. The lack of precise scientific tools (models with sufficient spatial and temporal resolution) to forecast climate change at local scales limits the ability to quantify accurately the potential future impacts of climate change in the planning area. Furthermore, potential impacts on climate change are influenced by GHG emission sources from around the world, and it is not possible to accurately distinguish the impacts on global climate change from GHG emissions originating just from the planning area; instead, the GHG emissions due to the federal action are compared with state, national, and global GHG emissions, along with other metrics.

Total GHG emissions from federal coal production, transportation, and downstream combustion shown in **Table 3-4** over the 20-year SEIS/RMPA lifetime, based on 20-year and 100-year GWPs are 7,619 MMT $CO_2$e and 7,354 MMT $CO_2$e, respectively. The downstream combustion portion is 7,238 MMT $CO_2$e and 7,193 MMT $CO_2$e, respectively.

Average annual GHG emissions from federal coal production in the planning area shown in **Table 3-4** are 15.7 MMT $CO_2$e and 4.8 MMT $CO_2$e for 20-year and 100-year GWPs, respectively. These represent 26 and 7.9 percent of the 60.4 MMT $CO_2$e total 2017 Wyoming GHG emissions for major facilities, as reported in the EPA FLIGHT data (EPA 2018b).

Average annual GHG emissions from federal coal production, transportation, and downstream combustion shown in **Table 3-4** are 398.9 MMT $CO_2$e and 367.7 MMT $CO_2$e for 20-year and 100-year GWPs, respectively. These represent 6.2 and 5.7 percent of the 6,457 MMT $CO_2$e total 2017 US GHG emissions reported by EPA (2019a). These represent 0.77 and 0.71 percent, of the 52 gigaton total 2010 global GHG emissions in $CO_2$e, as estimated by the IPCC (2014).

The average annual GHG emissions due to production, transportation, and downstream combustion of coal forecast to be produced in the BFO, using the 100-year GWP, are equivalent to the following, based on the EPA greenhouse gas equivalencies calculator (2019b):

- GHG emissions from 94 coal-fired power plants in 1 year
- GHG emissions avoided by 77,919 wind turbines running for 1 year

The corresponding numbers, based on the 20-year GWP, are 102 coal-fired power plants and 84,537 wind turbines.

Oil and Gas

**Table 3-5**, **Table 3-6**, and **Table 3-7** summarize GHG emissions from the production and downstream combustion of federal oil, conventional natural gas, and CBNG, respectively. The details by pollutant ($CO_2$, $CH_4$, and $N_2O$) are shown in **Appendix C**. GHG emissions would also result from transportation of oil and gas from the planning area by pipeline, rail, or tanker truck; however, the BLM does not have readily available data on how the transport of liquid and gaseous fossil fuels are distributed among the forms of transportation (pipeline, rail, and tanker truck) or the quantity distributed to each type. This information is necessary in order to quantify emissions that would be representative of actual or reasonably foreseeable future operations.

### Table 3-5
### GHG Emissions as CO2e from Federal Oil Production and Combustion, Based on 20-Year and 100-Year GWPs

| Year | Federal RFD Oil Production Rate (MMBO)[1] | $CO_2$e (Metric Tons, 20-Year GWP) | | | $CO_2$e (Metric Tons, 100-Year GWP) | | |
|---|---|---|---|---|---|---|---|
| | | Production | Combustion | Total | Production | Combustion | Total |
| 2019 | 3.4 | 109,807 | 153,733 | 263,540 | 66,198 | 150,466 | 216,664 |
| 2020 | 3.8 | 109,749 | 171,819 | 281,568 | 65,952 | 168,167 | 234,119 |
| 2021 | 4.1 | 104,413 | 185,384 | 289,797 | 62,490 | 181,444 | 243,934 |
| 2022 | 4.7 | 103,644 | 212,513 | 316,157 | 61,698 | 207,996 | 269,694 |
| 2023 | 5.1 | 95,049 | 230,599 | 325,648 | 56,166 | 225,698 | 281,864 |
| 2024 | 5.6 | 85,245 | 253,207 | 338,452 | 49,832 | 247,826 | 297,658 |
| 2025 | 5.8 | 88,289 | 262,250 | 350,539 | 51,612 | 256,676 | 308,288 |
| 2026 | 6.3 | 95,900 | 284,858 | 380,758 | 56,062 | 278,804 | 334,866 |
| 2027 | 6.3 | 95,900 | 284,858 | 380,758 | 56,062 | 278,804 | 334,866 |
| 2028 | 6.7 | 101,989 | 302,944 | 404,933 | 59,621 | 296,506 | 356,127 |
| 2029 | 6.7 | 101,989 | 302,944 | 404,933 | 59,621 | 296,506 | 356,127 |
| 2030 | 6.7 | 101,989 | 302,944 | 404,933 | 59,621 | 296,506 | 356,127 |
| 2031 | 6.7 | 101,989 | 302,944 | 404,933 | 59,621 | 296,506 | 356,127 |
| 2032 | 6.7 | 101,989 | 302,944 | 404,933 | 59,621 | 296,506 | 356,127 |
| 2033 | 6.7 | 101,989 | 302,944 | 404,933 | 59,621 | 296,506 | 356,127 |
| 2034 | 6.7 | 101,989 | 302,944 | 404,933 | 59,621 | 296,506 | 356,127 |
| 2035 | 6.7 | 101,989 | 302,944 | 404,933 | 59,621 | 296,506 | 356,127 |
| 2036 | 6.7 | 101,989 | 302,944 | 404,933 | 59,621 | 296,506 | 356,127 |
| 2037 | 6.7 | 101,989 | 302,944 | 404,933 | 59,621 | 296,506 | 356,127 |
| 2038 | 6.7 | 101,989 | 302,944 | 404,933 | 59,621 | 296,506 | 356,127 |
| **Total** | **118.8** | **2,009,879** | **5,371,604** | **7,381,480** | **1,181,903** | **5,257,442** | **6,439,350** |
| **Average** | **5.9** | **100,494** | **268,580** | **369,074** | **59,095** | **262,872** | **321,968** |

Source: Ramboll 2019

[1] MMBO=million barrels

### Table 3-6
### GHG Emissions as CO2e from Federal Conventional Natural Gas Production and Combustion, Based on 20-Year and 100-Year GWPs

| Year | Federal RFD Natural Gas Production (BCF) | $CO_2e$ (Metric Tons, 20-Year GWP) | | | $CO_2e$ (Metric Tons, 100-Year GWP) | | |
|---|---|---|---|---|---|---|---|
| | | Production | Combustion | Total | Production | Combustion | Total |
| 2019 | 40.8 | 211,226 | 141,039 | 352,266 | 104,430 | 140,891 | 245,321 |
| 2020 | 47.0 | 220,782 | 142,212 | 362,993 | 109,127 | 142,068 | 251,194 |
| 2021 | 54.5 | 229,872 | 163,832 | 393,704 | 113,585 | 163,666 | 277,251 |
| 2022 | 62.9 | 235,133 | 189,968 | 425,101 | 116,140 | 189,775 | 305,914 |
| 2023 | 70.3 | 229,077 | 219,186 | 448,264 | 113,092 | 218,964 | 332,055 |
| 2024 | 77.0 | 213,977 | 244,932 | 458,909 | 105,566 | 244,682 | 350,248 |
| 2025 | 80.8 | 224,537 | 554,681 | 779,218 | 110,775 | 554,105 | 664,880 |
| 2026 | 83.5 | 232,040 | 582,021 | 814,061 | 114,477 | 581,416 | 695,893 |
| 2027 | 82.7 | 229,817 | 601,375 | 831,192 | 113,380 | 600,749 | 714,129 |
| 2028 | 79.6 | 221,203 | 595,552 | 816,755 | 109,130 | 594,932 | 704,063 |
| 2029 | 79.6 | 221,203 | 573,307 | 794,509 | 109,130 | 572,710 | 681,841 |
| 2030 | 79.6 | 221,203 | 573,307 | 794,509 | 109,130 | 572,710 | 681,841 |
| 2031 | 79.6 | 221,203 | 573,307 | 794,509 | 109,130 | 572,710 | 681,841 |
| 2032 | 79.6 | 221,203 | 573,307 | 794,509 | 109,130 | 572,710 | 681,841 |
| 2033 | 79.6 | 221,203 | 573,307 | 794,509 | 109,130 | 572,710 | 681,841 |
| 2034 | 79.6 | 221,203 | 573,307 | 794,509 | 109,130 | 572,710 | 681,841 |
| 2035 | 79.6 | 221,203 | 573,307 | 794,509 | 109,130 | 572,710 | 681,841 |
| 2036 | 79.6 | 221,203 | 573,307 | 794,509 | 109,130 | 572,710 | 681,841 |
| 2037 | 79.6 | 221,203 | 573,307 | 794,509 | 109,130 | 572,710 | 681,841 |
| 2038 | 79.6 | 221,203 | 573,307 | 794,509 | 109,130 | 572,710 | 681,841 |
| **Total** | **1,475.1** | **4,459,691** | **9,167,865** | **13,627,557** | **2,201,004** | **9,158,351** | **11,359,355** |
| **Average** | **73.8** | **222,985** | **458,393** | **681,378** | **110,050** | **457,918** | **567,968** |

Source: Ramboll 2019

[1] BCF=billion cubic feet; production volumes are for total of conventional natural gas and CBNG production.

### Table 3-7
### GHG Emissions as $CO_2e$ from Federal Coalbed Natural Gas Production and Combustion, Based on 20-Year And 100-Year GWPs

| Year | Federal RFD Natural Gas Production (BCF)[1] | $CO_2e$ (Metric Tons, 20-Year GWP) | | | $CO_2e$ (Metric Tons, 100-Year GWP) | | |
|---|---|---|---|---|---|---|---|
| | | Production | Combustion | Total | Production | Combustion | Total |
| 2019 | 40.8 | 1,000,964 | 2,084,720 | 3,085,684 | 343,580 | 2,082,519 | 2,426,099 |
| 2020 | 47.0 | 964,722 | 2,401,515 | 3,366,237 | 331,349 | 2,398,981 | 2,730,330 |
| 2021 | 54.5 | 900,262 | 2,784,736 | 3,684,998 | 309,499 | 2,781,797 | 3,091,296 |
| 2022 | 62.9 | 786,951 | 3,213,943 | 4,000,894 | 270,960 | 3,210,551 | 3,481,510 |
| 2023 | 70.3 | 597,811 | 3,592,054 | 4,189,865 | 206,449 | 3,588,262 | 3,794,712 |
| 2024 | 77.0 | 346,214 | 3,647,759 | 3,993,974 | 120,550 | 3,643,909 | 3,764,460 |
| 2025 | 80.8 | 363,300 | 3,827,779 | 4,191,079 | 126,500 | 3,823,739 | 3,950,238 |

| Year | Federal RFD Natural Gas Production (BCF)[1] | $CO_2e$ (Metric Tons, 20-Year GWP) | | | $CO_2e$ (Metric Tons, 100-Year GWP) | | |
|---|---|---|---|---|---|---|---|
| | | Production | Combustion | Total | Production | Combustion | Total |
| 2026 | 83.5 | 375,440 | 3,955,687 | 4,331,127 | 130,727 | 3,951,512 | 4,082,239 |
| 2027 | 82.7 | 371,843 | 3,917,788 | 4,289,632 | 129,474 | 3,913,653 | 4,043,127 |
| 2028 | 79.6 | 357,905 | 3,770,931 | 4,128,835 | 124,621 | 3,766,950 | 3,891,571 |
| 2029 | 79.6 | 357,905 | 3,770,931 | 4,128,835 | 124,621 | 3,766,950 | 3,891,571 |
| 2030 | 79.6 | 357,905 | 3,770,931 | 4,128,835 | 124,621 | 3,766,950 | 3,891,571 |
| 2031 | 79.6 | 357,905 | 3,770,931 | 4,128,835 | 124,621 | 3,766,950 | 3,891,571 |
| 2032 | 79.6 | 357,905 | 3,770,931 | 4,128,835 | 124,621 | 3,766,950 | 3,891,571 |
| 2033 | 79.6 | 357,905 | 3,770,931 | 4,128,835 | 124,621 | 3,766,950 | 3,891,571 |
| 2034 | 79.6 | 357,905 | 3,770,931 | 4,128,835 | 124,621 | 3,766,950 | 3,891,571 |
| 2035 | 79.6 | 357,905 | 3,770,931 | 4,128,835 | 124,621 | 3,766,950 | 3,891,571 |
| 2036 | 79.6 | 357,905 | 3,770,931 | 4,128,835 | 124,621 | 3,766,950 | 3,891,571 |
| 2037 | 79.6 | 357,905 | 3,770,931 | 4,128,835 | 124,621 | 3,766,950 | 3,891,571 |
| 2038 | 79.6 | 357,905 | 3,770,931 | 4,128,835 | 124,621 | 3,766,950 | 3,891,571 |
| **Total** | **1,475.1** | **9,644,460** | **70,906,218** | **80,550,677** | **3,339,917** | **70,831,377** | **74,171,294** |
| **Average** | **73.8** | **482,223** | **3,545,311** | **4,027,534** | **166,996** | **3,541,569** | **3,708,565** |

Source: Ramboll 2019

[1] BCF=billion cubic feet; production volumes are for total of conventional natural gas and CBNG production.

The GHG emissions attributable to the transport of oil and gas produced from the planning area would occur in the form of $CO_2$, $CH_4$, and $N_2O$. GHG emissions attributable to the end use of the produced liquid and gaseous fossil fuels have been estimated by assuming that 100 percent is combusted for heat or energy production. Although the actual end use of these products may also include transportation fuels, stock for plastics, chemical, and synthetic materials production, or other manufacturing, it is reasonably foreseeable to estimate emissions from combustion.

As in the case of coal production, the GHG emissions discussed above due to oil and gas production and downstream combustion would contribute incrementally to global climate change, although at a much lower level, relative to the coal production, transportation, and downstream combustion. As noted previously, the lack of precise scientific tools (models with sufficient spatial and temporal resolution) to forecast climate change at local scales limits the ability to accurately quantify the future impacts on climate change in the planning area. Furthermore, potential impacts on climate change are influenced by GHG emission sources from around the world, and it is not possible to accurately distinguish the impacts on global climate change from GHG emissions originating just from the planning area; instead, the GHG emissions due to the federal action are compared with state, national, and global GHG emissions, along with other metrics.

Total GHG emissions from federal oil production and downstream combustion shown in **Table 3-5** over the 20-year RMP lifetime, based on 20-year and 100-year GWPs, are 7.4 MMT $CO_2e$ and 6.4 MMT $CO_2e$, respectively. Downstream combustion contributes 5.4 MMT $CO_2e$ and 5.3 MMT $CO_2e$.

Average annual GHG emissions from the production and downstream combustion of federal oil produced in the BFO (shown in **Table 3-5**) are 369,074 metric tons $CO_2e$ and 321,968 metric tons $CO_2e$ using 20-year and 100-year GWPs, respectively. These represent 0.6 and 0.5 percent of the 60.4 MMT $CO_2e$ total 2017 Wyoming GHG emissions for major facilities as reported in the EPA FLIGHT data (EPA 2018b).

Average annual GHG emissions from the production and downstream combustion of federal oil in the BFO represent 0.006 and 0.005 percent, respectively, of the 6,457 MMT $CO_2e$ total 2017 US GHG emissions reported by EPA (EPA 2019a) and 0.0007 and 0.0006 percent, respectively, of the 52 gigatonnes total 2010 global GHG emissions in $CO_2e$ estimated by IPCC (IPCC 2014).

The average annual GHG emissions reported above using the 100-year GWP are equivalent to the following, based on the EPA greenhouse gas equivalencies calculator (2019b):

- 0.083 coal-fired power plant GHG emissions in 1 year (or emissions from one power plant for 30 days),
- GHG emissions avoided by 68 wind turbines running for 1 year

The corresponding numbers based on the 20-year GWP are 0.095 coal-fired power plant GHG emissions and 78 wind turbines.

Total GHG emissions from federal natural gas production and downstream combustion (total of conventional natural gas and CBNG production and combustion) shown in **Table 3-6** and **Table 3-7** over the 20-year SEIS/RMPA lifetime, based on 20-year and 100-year GWPs, are 94.2 MMT $CO_2e$ and 85.5 MMT $CO_2e$. Downstream combustion represents 80.0 MMT $CO_2e$ and 80.0 MMT $CO_2e$.

The average annual GHG emissions from federal natural gas production and downstream combustion (total of conventional natural gas and CBNG production and combustion) shown in **Table 3-6** and **Table 3-7** are 4.7 MMT $CO_2e$ and 4.3 MMT $CO_2e$ using 20-year and 100-year GWPs, respectively. These represent 7.8 and 7.1 percent of the 60.4 MMT $CO_2e$ total 2017 Wyoming GHG emissions for major facilities, as reported in the EPA FLIGHT data (2018b). When compared with US GHG emissions, these values represent 0.073 and 0.067 percent, respectively, of the 6,457 MMT $CO_2e$ total 2017 US GHG emissions reported by EPA (2019a). When compared with global GHG emissions, these values represent 0.009 and 0.008 percent, respectively, of the 52 gigatonnes total 2010 global GHG emissions in $CO_2e$ estimated by IPCC (2014).

When GHG emissions from federal oil and gas developed in the BFO are combined (totals from **Table 3-5** and **Table 3-7**), the average annual GHG emissions are 5.1 MMT $CO_2e$ and 4.6 MMT $CO_2e$ using 20-year and 100-year GWPs, respectively. These represent 8.4 and 7.6 percent of the 60.4 MMT $CO_2e$ total 2017 Wyoming GHG emissions for major facilities, as reported in the EPA FLIGHT data (2018b). When compared with US GHG emissions, these values represent 0.079 and 0.071 percent, respectively, of the 6,457 MMT $CO_2e$ total 2017 US GHG emissions reported by EPA (2019a). When compared with global GHG emissions, these values represent 0.010 and 0.008 percent, respectively, of the 52 gigaton total 2010 global GHG emissions in $CO_2e$ estimated by the IPCC (2014).

The average annual GHG emissions estimated above for federal oil and gas developed in the BFO, using the 100-year GWP, are equivalent to the following, based on the EPA greenhouse gas equivalencies calculator (2019b):

- 1.2 coal-fired power plant GHG emissions in 1 year
- GHG emissions avoided by 975 wind turbines running for 1 year

The corresponding numbers based on the 20-year GWP are 1.3 coal-fired power plants and 1,081 wind turbines.

The Buffalo Field Office Proposed RMP/Final EIS discussed climate change in relation to potential threats to factors contributing to human health. In addition, the US Global Change Research Program (USGCRP) conducted an extensive Climate and Health Assessment to increase the understanding of the various ways climate change may pose a threat to human health (USGCRP 2016). This assessment builds on the Third National Climate Assessment, and some of its findings include the following:

- Average temperatures have been rising and extreme temperatures (hot and cold) have intensified in many parts of the country. Days that are hotter than the average seasonal temperature in the summer or colder than the average seasonal temperature in the winter can cause increased levels of illness and death by compromising the body's ability to regulate its temperature or by inducing direct or indirect health complications.
- Climate change has the potential to harm human health through exposure to degraded air quality.
- Some American populations could be disproportionately vulnerable to climate change, including those with low income, some communities of color and immigrant groups, children and pregnant women, older adults, vulnerable occupational groups, persons with disabilities, and persons with preexisting or chronic medical conditions.
- Some regions of the United States have already observed changes in the frequency, intensity, or duration of certain extreme events, and projections from climate models show that the occurrence and severity of these events could continue to increase with climate change. Extreme weather events are known to have health impacts such as death or injury during an event (for example, drowning during floods). In addition, before or after an extreme event individuals may be involved in activities that put their health at risk (e.g., disaster preparation and post-event cleanup) or may be unable to get sufficient water, food, or medical care following an extreme event. Health risks may also arise long after the event, or in places outside the area where the event took place, as a result of damage to property, destruction of assets, loss of infrastructure and public services, social and economic impacts, environmental degradation, and other factors.

### *Cumulative Impacts*

Cumulative impacts are evaluated from the total production of federal and nonfederal coal, oil, and gas in the planning area, as well as other past, present, and reasonably foreseeable sources of reportable GHG emissions. GHG emissions from the production, transportation, and downstream combustion of coal forecast to be produced on nonfederal lands in the planning area are evaluated following methods similar to those described above using EIA 2019 nonfederal coal production forecasts for the plan period. GHG emissions from the production and downstream combustion of oil and gas forecast to be developed from non-federal minerals in the planning area (see the 2015 Proposed RMP/Final EIS; BLM 2015) are assessed using methods similar to those described for federal oil and gas above. GWP values for both 20- and 100-year time horizons are used (see **Table 3-2**).

Direct and indirect emissions from nonfederal coal, oil, and gas are combined with direct and indirect emissions from federal coal, oil, and gas, as described above. These emissions totals are also combined with emissions from large sources other than coal mining and oil and gas development and production in the planning area for the most recent (2017) EPA FLIGHT data.

**Table 3-8** reports the cumulative effects in terms of GHG emissions from the sources listed above. These include GHG emissions in the planning area, including federal and non-federal coal and oil and gas and other major sources, as well as downstream combustion emissions outside the area, resulting from coal and oil and gas developed in the area.

## Table 3-8
## Production and GHG emissions as $CO_2$e (Average Over Planning Period) from Cumulative Sources, Based on 20-Year and 100-Year GWPs

| Production | GHG Emissions | GHG Emissions in $CO_2$e (MMT/Year) | |
|---|---|---|---|
| | | 20-year GWP | 100-year GWP |
| Federal coal production<br>213.0 MMst/yr | GHG emissions from federal coal production | 15.7 | 4.8 |
| | GHG emissions from federal coal transportation | 3.3 | 3.3 |
| | GHG emissions from federal coal combustion | 361.9 | 359.7 |
| Non-federal coal production<br>31.0 MMst/yr | GHG emissions from non-federal coal production | 2.3 | 0.7 |
| | GHG emissions from non-federal coal transportation | 0.5 | 0.5 |
| | GHG emissions from non-federal coal combustion | 52.6 | 52.3 |
| Federal oil production<br>5.9 MMBO/yr | GHG emissions from federal oil production | 0.1 | 0.06 |
| | GHG emissions from federal oil combustion | 0.3 | 0.3 |
| Federal production of conventional and coalbed natural gas<br>73.8 BCF/yr | GHG emissions from federal gas production | 0.7 | 0.3 |
| | GHG emissions from federal gas combustion | 4.0 | 4.0 |
| Non-federal oil production<br>6.3 MMBO/yr | GHG emissions from non-federal oil production | 0.10 | 0.06 |
| | GHG emissions from non-federal oil combustion | 0.3 | 0.3 |
| Non-federal production of conventional and coalbed natural gas<br>124.7 BCF/yr | GHG emissions from non-federal gas production | 1.3 | 0.5 |
| | GHG emissions from non-federal gas combustion | 3.4 | 3.4 |
| Other cumulative GHG emission sources | GHG emissions from other major sources in 2017 in planning area from FLIGHT (EPA 2018b)* | 10.2 | 10.1 |
| **Cumulative GHG emissions in $CO_2$e (annual average over plan period)** | - | **456.7** | **440.3** |

Source: Ramboll 2019
All numbers shown are annual average over planning period except for FLIGHT data.
MMst=million short tons; MMT=million metric tons; MMBO-million barrels of oil; BCF=billion cubic feet
Cumulative totals may not add up due to rounding.
*FLIGHT facility emissions include emissions from power plants in the planning area, which are included in the downstream combustion of coal category; therefore, the cumulative GHG emissions shown in the next row are an over-estimate

### *Summary*

GHG emissions from the production and downstream combustion of coal, oil, and conventional and coal bed natural gas under the SEIS/RMPA were calculated using 100-year and 20-year GWPs. This was done to represent GHG impacts over the longer-term 100-year timespan used in the EPA's national GHG inventory and the shorter 20-year life of the RMP for comparison. GHG emissions from coal transportation were also quantified. GWP values selected for this analysis represent the most current widely recognized and widely used estimates in the climate science community. Differences in $CO_2$e emissions between the two time horizons mostly reflect the short atmospheric lifetime of methane, relative to carbon dioxide and nitrous oxide. As a result, the differences are largest for such sources as coal production with relatively large ratios of methane-to-carbon dioxide emissions.

Coal, oil, and gas production and therefore GHG emissions are the same under Alternative A (the No Action Alternative) and Alternative B (the action alternative). Average annual GHG emissions over the RMP plan period for coal, oil, and gas are compared for federal and nonfederal resources and with other cumulative sources in **Table 3-9**. Cumulative annual average emissions (total $CO_2e$) are 456.7 MMT/year and 440.3 MMT/year, using the 20-year and 100-year time horizon GWPs, respectively. These values represent 6.8 percent and 0.8 percent of the total 2017 national and 2010 global annual $CO_2e$ emissions,[4] respectively. These were based on the 100-year time horizon values and will contribute to the climate change impacts described under *Affected Environment*, above.

**Table 3-9**
**Summary of Annual Average GHG Emissions from Coal, Oil, and Gas Production, Transport, and Downstream Combustion Over the 20-Year Life of the SEIS/RMPA RFD**

| Annual Average GHG Emissions | $CO_2e$ MMT/Year (20-Year GWPs) | $CO_2e$ MMT/Year (100-Year GWPs) |
|---|---|---|
| Federal action total | 386.0 | 372.5 |
| Nonfederal total | 60.5 | 57.8 |
| Other cumulative sources within the planning area | 10.2 | 10.1 |
| **Total (annual average over life of the SEIS/RMPA)*** | **456.7** | **440.3** |

Source: Ramboll 2019
* Numbers may not add exactly to the total due to rounding

Over the 20-year life of the plan, SEIS/RMPA sources will release 1,442 and 1,430 MMT $CO_2e$ for 20-year and 100-year time horizon GWPs, respectively. Approximately 16 percent of emissions from the RFD are associated with nonfederal resources. Other cumulative sources in the planning area contribute just over 2 percent of total emissions.

Downstream combustion is the dominant source of GHGs for coal and gas: combustion $CO_2e$ emissions account for 95 percent and 98 percent of the RFD (action) emissions shown in **Table 3-9** for 20-year and 100-year GWPs, respectively. By 2038, global GHG emissions are estimated to be between approximately 30 and 80 gigatonnes $CO_2e$ annually under the IPCC lower bound and higher bound representative concentration pathways (RCP 2.6 and RCP 8.5), respectively (IPCC 2014). Cumulative annual average emissions over the plan period thus represent between 1.5 percent and 0.6 percent of the global emissions. This would be the case under different future global representative concentration scenarios and would contribute, in part, to the climate change impacts described under *Affected Environment*, above.

### 3.5.2 Economic Considerations

This section incorporates by reference the affected environment described in the 2015 Proposed RMP/Final EIS (Section 3.8, Socioeconomic Resources, p. 607). A summary as it pertains to the decisions for this SEIS/RMPA is included below.

#### *Affected Environment*

Although the BFO administers public lands and resources in Campbell, Johnson, and Sheridan Counties, there are strong social and economic ties between the BFO and communities in Converse, Crook, Natrona, and Weston Counties. While the 12 mines producing federal coal in Wyoming's Powder River Basin are in Campbell County, many of the miners and mine operations personnel live in surrounding counties. Because so many of the mines' employees have long commutes from residences in other counties, several of the mine operators run commuter buses to and from surrounding counties to minimize traffic and safety risks associated with drowsy driving after long shifts. General demographic and economic information for these counties can be found in their respective RMPs: Campbell County, Johnson County, and Sheridan counties in the Buffalo RMP (BLM 2015); Converse and Natrona counties in the Casper RMP (BLM 2007) and Crook and Weston Counties in the Newcastle RMP (BLM 2000).

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[4] 2010 is the year of the most recent global GHG emissions inventory shown in the IPCC Fifth Assessment (IPCC 2014).

While Wyoming's Powder River Basin does not share the same multi-generational legacy as Appalachia, coal employment has become deeply rooted in the personal and cultural identity of northeastern Wyoming over the last 30-plus years. Individuals that work for coal mines in Campbell County enjoy good pay and benefits, but they also take great pride in being part of America's coal heritage and in helping to power homes and businesses across the country. The broader communities in which these miners and mine operations personnel live also collectively take pride in the fact that their residents are hardworking individuals whose labor is helping to power the country. Homage for these qualities often serve as a foundation for strong bonds within communities, and logos, mascots, and themed community events often serve as reminders of the ties that bind residents to each other and to the Powder River Basin.

*Attitudes, Values, and Beliefs*

People have strong attitudes, values, and beliefs (AVBs) associated with natural resources, and these AVBs shape the way they view natural resource issues and public land management. AVBs associated with coal and the BFO's management of federal coal resources are diverse and held by those who live in the region and across the country. AVBs associated with the BFO's management of federal coal resources expressed during scoping related to three categories: local economic opportunities and employment, mineral revenues and funding for public services, and other resources.

*Local Economic Opportunities and Employment*

Public officials and residents are often concerned about how changes in public land management may affect their livelihoods or those of their constituents. While larger cities generally have more diversified economies and a greater number of employment opportunities, rural communities are often more specialized with respect to natural resource-dependent industries (e.g., mineral development, agriculture, and outdoor recreation); thus, management of natural resources can have a disproportionately large effect on economic opportunities and employment in rural communities.

Relative to other natural resource dependent industries in the US, jobs in the coal industry are highly concentrated geographically within a few producing regions and cumulatively account for a very small proportion of total employment opportunities across the country. In 2017, the coal industry employed an average of 53,051 miners and mine operations personnel, most of which were employed in Wyoming, West Virginia, Kentucky, and Illinois. Wyoming mines supported 5,637 of these coal jobs in 2017, and 1 out of every 11 coal jobs in the US that year were supported by the 12 mines operating in the Wyoming portion of the PRB (MSHA 2019; EIA 2018). Relative to total county employment, jobs supported by these 12 mines accounted for 13.5 percent of all employment opportunities in Campbell County and 2 percent in Converse County in 2017 (MSHA 2019; BEA 2019).

Employment in the coal industry fluctuates annually with production levels. In 2018 production across the 12 mines declined by approximately 11.9 MMst from the previous year. This translated to a loss of 75 coal jobs, with a total of 4,702 miners and mine operations personnel employed across the 12 mines (MSHA 2019). These jobs in the coal industry were estimated to have supported $539.1million in direct labor income that year.

Coal production can also stimulate economic opportunities and employment in other industries. In 2018, coal production and employment in Wyoming's Powder River Basin was estimated to support an additional

7,302 jobs and $437.3 million in labor income regionally in industries that supply goods and services to the coal industry (indirect employment and labor income), as well as in industries where miners, mine operations personnel, and those who work in the coal industry's supply chain spend their income (induced employment and labor income). Since federal coal estate accounts for approximately 90 percent of all coal in Wyoming's Powder River Basin, the majority of these economic opportunities were attributable to the development of federal coal administered by the BLM.

### *Mineral Revenues and Funding for Public Services*

Since mineral revenues serve as an important funding mechanism for schools, roads, infrastructure, and public services, public officials are often concerned about how management and development of minerals in their jurisdiction may affect government coffers. Production of federal coal in the BFO generates federal, state, and local revenues through royalties, rents, state severance taxes, and local ad valorem taxes. Revenues generated through these mechanisms, and disbursed according to legal statutes, are substantial and account for a large share of total state and local total revenues each year. Since mineral revenues are a function of production levels and market prices, even relatively small changes in these factors can mean big gains or losses in revenues.

#### Federal Revenues

Annual mineral revenues generated from leased federal coal are derived from rents and royalties. In 2018, the 12 mines operating in the BFO held leases on 131,837acres of federal coal estate that were subject to annual rents of $3 per acre. Collectively, these leases generated more than $395,511 in rental revenue. These mines are also required to pay royalties on the value of minerals extracted from their federal mineral leases. Coal mined from the surface of federal tracts is subject to royalties assessed at 12.5 percent of the minerals' gross market value. All federal mineral revenues are collected by the Office of Natural Resource Revenue (ONRR), and 49 percent of these receipts are disbursed back to the state in which they were generated (ONRR 2019).

#### State Revenues

In additional to the 49 percent of federal mineral receipts returned to the state, coal mine operators in Wyoming's Powder River Basin are required to pay severance taxes to the state. These taxes are assessed on the taxable value of production at 7 percent. In 2018, the extraction of federal coal in the BFO generated more than $200 million in state severance taxes. The distribution of severance tax revenues is set by the Wyoming legislature, with concurrence by the governor. The basic formula includes a constitutionally mandated 2.5 percent diversion of proceeds to the Permanent Wyoming Mineral Trust Fund (PWMTF), while the remaining revenues are distributed based on a legislatively established, two-tier formula to fund environmental remediation of leaking underground storage tanks, water development, local governments, highway and state aid to county road funds, capital construction, education, the State's general fund, and its budget reserve account (WY Stat § 39-14-801).

#### Local Revenues

In addition to federal royalties and state severance taxes, coal extracted from federally leased tracts is also subject to local ad valorem taxes, which is a property tax assessed at 100 percent of the market value of gross production and retained by the county where production occurs. While all 12 mines are considered to be in Campbell County, the southernmost mine straddles the Campbell and Converse County line. Approximately one-third of their production comes from minerals in Converse County; thus, both counties collect ad valorem taxes from the production of federal coal. Mines operating in the BFO owed $20.7 million in ad valorem taxes to Campbell County from their production of federal coal, while another $560,000 in ad valorem taxes on federal coal was assessed by Converse County.

While a portion of federal and state mineral revenues generated from federal coal production are distributed back to Campbell and Converse Counties, these counties and the municipalities and special districts in them largely rely on ad valorem taxes to fund schools, roads, hospitals and to provide public services for residents. As discussed above, changes in production levels or market prices can mean big gains or losses in revenues.

*Other Resources*

During public scoping, people also expressed AVBs associated with other resources, specifically concerns about adverse impacts on wildlife and aquatic species and water resources.

Many individuals, both those living in and outside the BFO's social and economic environment, also expressed AVBs associated with climate change and the potential risk it poses to the health and well-being of people. While there is still uncertainty in the degree to which climate will change and in how people may be affected, depending on which climate models are used, many Americans believe that climate change is the greatest challenge that humanity currently faces.

### *Direct and Indirect Impacts*

Coal production is driven by the market demand for coal in the US electric fuel energy mix. The combination of a large supply and lower prices is expected to increase the propensity of natural gas in the US electric generation fuel mix, leading to the decreased competitiveness of coal-fired electricity generation and eventual retirements of less efficient coal plants (AEO 2019). Forecast market demand for coal is described in further detail in **Appendix B**.

*Analysis Methods*

Assumptions

- Coal production levels will not change across alternatives, although there are differences in the number of acres acceptable for further consideration for leasing. The current level of leases and lease applications would support levels of production.
- Federal, state, and local taxes will continue to be collected on coal produced in the socioeconomic analysis area.
- The pace and timing of coal development will continue to depend on many factors outside of the BLM's control, most notably the price of coal products on regional, national, and international markets and on national and world market conditions.
- Federal commercial mine production will occur at currently operating mines.
- There will be no disruptive changes to current technology used for coal development.
- Coal production is analyzed for low-sulfur, sub-bituminous coal.

Indicators

- Employment supported by coal production
- Labor income supported by coal production
- Value added supported by coal production
- Tax revenue collected by federal government, state, and counties supported by coal production

*Direct, Indirect, and Induced Effects*

Although considerations by the BLM to alter the Alternative A CDPA have the potential to affect the acreage and total reserves brought forward for further leasing consideration, proposed changes to the CDPA are unlikely to affect production over the next 20 years. The 12 mines operating in the BFO have federal coal leases that grant their operations valid and existing rights to the recoverable reserves remaining on their leases. While the initial terms of federal coal leases are for 20 years, leases that demonstrated diligent development within the first 10 years of issuance can be extended for as long as commercial quantities of coal are produced each year.

Annual commercial quantity requirements can be met by production of coal, payment of an advance royalty in lieu of coal production, or a combination of both. Since mines already have recoverable reserves on hand, annual production decisions are driven by market demand and minemouth prices[5] for low-sulfur sub-bituminous coal from Wyoming's Powder River Basin.

Longer-term production decisions are still heavily influenced by market conditions and forecasts, but also whether a mine operator can incur additional debt to obtain leases on new coal tracts and still operate with a sufficient profit margin. As reasonably foreseeable coal development is a function of both short-term and long-term production decisions, the RFD for coal in the BFO is governed by short-term and long-term forecasts of market demand and prices. For a detailed discussion of the RFD, its underlying assumptions, and market trends forecast by the Energy Information Administration, see **Appendix B**.

Local Economic Opportunities and Employment

Forecasts for the domestic energy market show that coal will account for a declining share of the US electric generation mix over the next 20 years, causing the demand for and production of Wyoming Powder River Basin coal to decline. The 2019 annual energy outlook (AEO) projections for Wyoming's Powder River Basin show that production is anticipated to fall by approximately 1 percent annually between 2019 and 2038 (EIA 2019b). The RFD developed based on AEO 2019 forecasts for the region projects that 236.6 MMst of coal will be mined from the BFO on annual average over the planning period, 213 MMst of which will be produced from federally leased coal tracts (**Appendix B**).

Based on recent production volumes per worker at the 12 coal mines, federal coal production is forecast to support 3,413 coal jobs and $391.3 million in direct labor income on annual average over the next 20 years. The indirect and induced employment stimulated by production in the coal industry is further projected to support another 5,300 jobs and $343.5 million in labor income across the seven counties. For more information on annual average economic contributions of federal coal production under the RFD, see **Appendix D**.

Declining coal production and employment in the coal industry, whether projected or realized, can be concerning to rural communities, not only because local employment opportunities can be more limited, but because non-management wages in the coal industry are often higher than those in other local industries. According to national wage estimates published by the Bureau of Labor Statistics, production and nonsupervisory coal miners earned a median wage of around $33 per hour. First-line supervisors of mechanics, installers, and repairers at coal mines earned around $42 per hour, while mining machine operators earned about $27 per hour. Support services staff also tend to be well compensated, with human resource specialists making $30 per hour, financial clerks earning $21 per hour, and administrative assistants earning $18 per hour (BLS 2018).

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[5] Mine Mouth Electric Plants are coal-burning electricity generating power plans that purchase directly from coal mines. They report prices to the Energy Information Administration Agency (EIA) within the US Department of Energy.

The loss of coal jobs can also have a ripple effect within the regional economy, resulting in additional job losses in industries that supply goods and services to the coal industry, as well as in industries where miners, mine operations personnel, and those who work in the coal industry's supply chain spend their wages.

Increases in unemployment often give rise to economic instability in local communities, and the stress of financial uncertainty and instability can negatively affect the well-being of residents. Because this region is so dependent on mineral extraction, it has survived several boom and bust cycles. During these periods of bust, affected residents can feel increasing despair as they struggle to find work or take jobs that pay much lower wages. Demand for public services, including public assistance programs, alcohol and drug treatment, and law enforcement, have also been observed to increase during economic downturns that result from slowed activity and lower employment in the region's mineral extraction industries. Collectively, these factors can adversely affect community cohesion and quality of life in affected communities.

Mineral Revenues and Funding for Public Services

Federal Revenues

Forecast production of federal coal under the RFD will continue to generate these annual rents and royalties. On annual average, leasing and production of federal coal in the BFO is projected to generate $346.3 million between 2019 and 2038.

State Revenues

Forecast annual average production under the RFD is estimated to continue to generate nearly $156.8 million in state mineral tax revenue between 2019 and 2038.

Local Revenues

Forecast production of federal coal under the RFD will continue to generate ad valorem taxes in these counties; however, production in Converse County is anticipated to taper off over the next 10 years. On annual average, leasing and production of federal coal in the BFO is projected to generate $16.9 million in ad valorem tax revenue for Campbell County between 2019 and 2038 and nearly $453,000 in tax revenues for Campbell County over the next 10 years. Future declines in coal production based on forecast market conditions are likely to cause local governments and special districts to face budget deficits. The timing of these budget shortfalls will further strain local governments and special districts, as funding shortages overlap with increasing demand for public services as a result of rising unemployment.

Other Resources

As forecast federal coal production under the Alternative B CDP would be the same as under the Alternative A CDP, impacts on the AVBs discussed above would be the same as those forecast and discussed above in *Affected Environment.* Impacts associated with other resources serve as a proxy for impacts on their AVBs. These impacts are discussed in **3.5.3**, Biological Resources. While potential impacts of climate change on people have not been monetized using social cost metrics (see **Appendix D** for further discussion on why these metrics were not used), impacts of climate change on human health and safety are discussed in **Section 3.5.1**, Air Resources, including greenhouse gases and climate change.

### *Cumulative Impacts*

Past, present, and reasonably foreseeable future actions in and near the planning area have the potential to affect coal production outside of BLM management decisions.

Non-federal coal accounts for approximately 10 percent of total coal production in Campbell County. Direct spending and employment from non-federal coal producers has additional direct, indirect, and induced economic effects that ripple throughout the state and local economies. Coal companies must pay corporate income taxes to the IRS and a coal excise tax on mining. Current coal excise rates are $0.25 per ton of coal for surface mines, but coal excise taxes are limited to 2 percent of the market value (ONRR 2019c). The IRS transfers collected funds to the BLDTF (ONRR 2019c). Reductions in coal production are also expected for non-federal coal, and economic losses associated with reduced non-federal coal productions would have additional effects not described under *Environmental Consequences*.

Coal market demand has the potential to vary from EIA estimates, based on market factors driving changes in demand for the domestic fuel generation energy mix. The abundance and low prices of natural gas are expected to reduce the demand for coal production for energy generation and lead to the retirements of less efficient coal plants through 2050. While global market demand is expected to increase, driven by coal-powered generation in China, India, and Southeast Area, US coal exports may not increase due to competitiveness of suppliers closer to major global markets. More information on domestic and international coal markets, coupled with how PRB coal compares in quality to open market sales, is described in **Appendix B**.

### 3.5.3 Biological Resources (Unsuitability Criteria #9,11,12, 14, and 15)

#### *Affected Environment*

Detailed descriptions of BLM special status wildlife can be found in Section 3.4.9, Special Status Species—Wildlife (including Greater Sage-Grouse) of the 2015 Proposed RMP/Final EIS and in Section 3.10.8 Threatened, Endangered, Proposed, and Candidate Species, BLM Sensitive Species, and USFS Sensitive Species and Management Indicator Species of the Wright Area Final EIS (BLM 2015, 2010).

**Table 3-10** summarizes BLM special status species with potential to occur in the CDPAs for both alternatives. Detailed descriptions of general fish and wildlife resources can be found in Section 3.4.6, Fish and Wildlife Resources—Wildlife of the 2015 Proposed RMP/Final EIS and Section 3.10 Wildlife of the Wright Area Final EIS (BLM 2015, 2010). Due to the relationship between wildlife habitats managed by the BLM and wildlife species managed by the WGFD, the two agencies established a statewide agreement to facilitate cooperation for wildlife.

**Table 3-10**
**Special Status Species with Potential for Occurrence in the CDPAs**

| Common Name | Applicable Unsuitability Criterion Number | Potential to Occur in the CDPAs |
|---|---|---|
| Bald-golden eagle nests<br>Bald-golden eagle roosts | 11<br>12 | Present; nests and roosts documented in the Alternative A CDPA |
| Ferruginous hawk | 14 | Present; nests documented in the Alternative A CDPA |
| Greater Sage-Grouse | 15 | Present; leks and priority habitat in the Alternative A CDPA |
| Swainson's hawk | 14 | Present; common summer breeder in Wyoming |
| Western burrowing owl | 15 | Present (breeding); confirmed breeder throughout much of Wyoming |
| Baird's sparrow | 14 | Low; uncommon summer resident that uses short-grass prairie habitats |
| Brewer's sparrow | 14 | Present; common summer resident occupying sagebrush shrubland and other shrubland habitats throughout the state |

| Common Name | Applicable Unsuitability Criterion Number | Potential to Occur in the CDPAs |
|---|---|---|
| Loggerhead shrike | 14 | Present; common summer resident, using pine-juniper, woodlands, short and mixed-grass prairies, and shrublands |
| Long-billed curlew | 14 | Low (breeding); common summer breeding resident throughout much of central and western Wyoming; rare in eastern Wyoming |
| Mountain plover | 14 | Present; observations in the Wyoming Natural Diversity Database include sightings near Gillette and in the Thunder Basin National Grassland. |
| Sage sparrow | 14 | Low; no observations in the Alternative A CDPA |
| Sage thrasher | 14 | Present; resident throughout Wyoming |
| Trumpeter swan | 14 | Present, observations in the Wyoming Natural Diversity Database |
| White-face ibis | 14 | Low; no observations in the Alternative A CDPA |
| Black-tailed prairie dog | 15 | Present; occur in the eastern third of Wyoming |
| Northern long-eared bat | 9 | Low; northeastern Campbell County is the extreme western edge of its known summer range; limited summer roosting and foraging habitat in the Alternative A CDPA. No maternity or hibernacula known in Wyoming. |
| Swift fox | 15 | Present; considered common in Wyoming. |
| Northern leopard frog | 15 | Present; inhabits permanent water bodies of the prairie, foothill, and montane zones below 9,000 feet; found throughout Wyoming |
| Ute ladies-tresses orchid | 9 | Low; occurrences in Converse, Goshen, Laramie, and Niobrara Counties of eastern Wyoming; identified in the Antelope Creek watershed. Not documented despite several years of surveys associated with the Campbell County mines. |

*Federal Threatened and Endangered Species*

There is no federal designated critical habitat in the CDPAs but there are two listed species with potential to occur. The northern long-eared bat is the only federally listed wildlife species with potential to occur in Campbell County; however, its preferred summer roosting habitat is conifer forest, which is less than 1 percent of the CDPAs (960 acres in Sheridan County and 3,690 acres in Campbell County under Alternative A and 1,400 acres in Campbell County under Alternative B), making the potential for disturbing this species unlikely.

Bats can use a wide variety of habitats, although caves and abandoned mines are critical habitat components that they depend on for nurseries and hibernacula.[6] The closest known maternity roost and hibernacula are in the Black Hills in South Dakota outside of the CDPA. One northern long-eared bat observation has been documented in northeast Campbell County, north of the Alternative A CDPA.

One threatened plant species, Ute ladies'-tresses orchid, could be present in the CDPAs and is known to occur in Converse, Goshen, Laramie, and Niobrara Counties of eastern Wyoming; it has been identified in the Antelope Creek watershed, upstream of the southern coal mines. A description of Ute ladies'-tresses orchid is in Section 3.9.3 Threatened, Endangered, Proposed, and Candidate Plant Species in the Wright Area EIS (BLM 2010). Habitat for this perennial orchid includes riparian and wet meadow habitats, along riparian edges, gravel bars, old oxbows, high flow channels, and moist to wet meadows along perennial streams. It typically occurs in stable wetland and seepy areas associated with old landscape features in historical floodplains of major rivers. Threats to this species include water developments, competition from invasive species, habitat fragmentation, urbanization, and collection by humans (USFWS 1992).

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[6] A shelter occupied during the winter by a dormant animal.

### *Bald and Golden Eagle Nest and Roosts*

Eagle nests and roosts have been documented in both CDPAs. Bald eagles are closely associated with water bodies to provide for their mainly fish diets. Golden eagles are wide ranging and can use a variety of habitats for foraging including prairie, agricultural, and sagebrush communities (see **Table 3-1** for vegetation acres in the CDPAs). They require suitable cliffs or large trees for nesting. Presently there are no identified eagle winter roosts sites in the RFD area.

### *Migratory Bird Species of High Federal Interest*

Presently there are no migratory birds of high federal interest, but BLM special status species could become of high interest in the future, and therefore they are discussed. There are five BLM special status migratory birds—Brewer's sparrow, loggerhead shrike, mountain plover, sage thrasher, and trumpeter swan—that are known to be present or have high potential to occur in the CDPAs (**Table 3-10**). Mountain plover and loggerhead shrike use prairie and, occasionally, agricultural vegetation communities; Brewer's sparrow and sage thrasher are dependent on sagebrush habitats (see **Table 3-1** for vegetation acres in the CDPAs). Threats to migratory birds are habitat fragmentation and degradation, land conversion, incompatible land uses, water quantity and quality, collision with and power lines, and interspecific competition for nest sites.

There are five BLM special status raptor species—Swainson's hawk, ferruginous hawk, western burrowing owl, golden eagle, and bald eagle—that are known to occur in the CDPAs (**Table 3-10**). (Bald and golden eagle nests and roost are covered above.) All raptor nests would be considered during coal lease applications and coal development.

**Table 3-11** shows documented raptor nests current when this document was written. Threats to raptors are habitat degradation, fragmentation, and loss, collision and electrocution from power lines, and incompatible land use practices, such as land conversion, clear cutting, industrial activities, and burrowing mammal removal. Other challenges are impacts from contaminants and human disturbance during sensitive periods (BLM 2015). The number of raptor nests in the Alternative A coal development potential area are 524 in Campbell County and 50 in Sheridan County; in the Alternative B CDPA, there are 389 known raptor nests. In the RFD area, 106 raptor nests were identified.

Riparian and wetland habitats provide important habitat for migratory birds. Detailed descriptions of riparian and wetland communities can be found in Section 3.4.3, Vegetation, Riparian/Wetland Resources, in the 2015 Proposed RMP/Final EIS, and Section 3.7, Wetlands, pages 3-165 through 3-175 in the Wright Area Final EIS (BLM 2015; 2010). Wetlands would be inventoried as part of the leasing application process, where a determination of unsuitability would be made in coordination with the US Army Corp of Engineers and Wyoming DEQ. There are 590 acres of riparian habitat (210 acres in Sheridan County and 380 acres in Campbell County) and 4,660 acres of wet meadows (2,290 acres in Sheridan County and 2,370 acres in Campbell County) under Alternative A and 340 acres riparian and 2,200 acres wet meadows in Campbell County under Alternative B acceptable for further consideration for leasing (see **Table 3-1** for vegetation acres in the CDPAs); nevertheless, coal development and surface disturbance are expected to occur only in the RFD area, not the full CDPAs. Presently, 210 acres riparian habitat and 320 acres of wet meadow are mapped in the RFD area. Wet meadows and riparian areas are diverse and valuable habitats. Wetlands are regionally sparse, and few are in Wyoming (BLM 2015).

### Table 3-11
### Identified Raptor Nests in the CDP Areas and RFD Area

| Raptor Nests | Nests CDP Area Alternative A (Sheridan County) | Nests CDP Area Alternative A (Campbell County) | Nests CDP Area Alternative A (Total) | Nests CDP Area Alternative B | Nests Coal RFD Area |
|---|---|---|---|---|---|
| Bald eagle | 14 | 2 | 16 | 2 | 0 |
| Burrowing owl | 1 | 9 | 10 | 9 | 10 |
| Ferruginous hawk | 0 | 347 | 347 | 259 | 44 |
| Golden eagle | 11 | 73 | 84 | 45 | 16 |
| Great-horned owl | 5 | 13 | 18 | 11 | 0 |
| Merlin | 1 | 0 | 1 | 0 | 0 |
| Osprey | 1 | 0 | 1 | 0 | 0 |
| Northern harrier | 0 | 6 | 6 | 5 | 4 |
| Prairie falcon | 3 | 0 | 3 | 0 | 0 |
| Red-tailed hawk | 26 | 61 | 87 | 45 | 10 |
| Short-eared owl | 0 | 3 | 3 | 3 | 4 |
| Swainson's hawk | 0 | 50 | 50 | 46 | 10 |
| Unknown buteo | 0 | 11 | 11 | 8 | 0 |
| Unknown raptor | 37 | 63 | 100 | 37 | 8 |

Sources: BLM GIS Data 2019; WGFD GIS Data 2018

Energy development, roads, dispersed recreation, urbanization, grazing, and climate change can degrade riparian and wetland habitats. The cumulative impacts of multiple uses complicate the effectiveness of land management to achieve riparian objectives. Riparian and wet meadow habitats account for approximately 5,250 acres of the Alternative A CDPA and 2,540 acres of the Alternative B CDPA. In the RFD area, 210 acres of riparian and 320 acres of wet meadow habitat are documented under both alternatives; however, extensive wetland and riparian surveys have not been conducted for the entire RFD area and may be modified as more information and surveys are completed.

*Species of High State Interest*

Detailed descriptions of BLM special status wildlife can be found in Section 3.4.9, Special Status Species—Wildlife (including Greater Sage-Grouse) and descriptions of general fish and wildlife resources can be found in Section 3.4.6, Fish and Wildlife Resources—Wildlife of the 2015 Proposed RMP/Final EIS and Section 3.10.8 Threatened, Endangered, Proposed, and Candidate Species; BLM Sensitive Species; and USFS Sensitive Species and Management Indicator Species of the Wright Area Final EIS (BLM 2015; 2010).

The Powder River Basin Greater Sage-Grouse population is known to occur in the CDPAs. The State of Wyoming created a Greater Sage-Grouse conservation strategy (Executive Order 2015-4) to ensure the conservation of the species in Wyoming.

BLM special status mammals known to occur are the black-tailed prairie dog and swift fox. Black-tailed prairie dogs are found throughout the Great Plains in short-grass and mixed-grass prairie area. Its population and range have declined due to habitat degradation and pest control. Many other wildlife species, such as the swift fox, mountain plover, ferruginous hawk, and burrowing owl, depend on the black-tailed prairie dog for some portion of their life cycle. Prairie habitats comprise 398,360 acres under Alternative A (51,230 acres in Sheridan County and 347,130 acres in Campbell County) and 267,880 acres under Alternative B CDPA. In the RFD area, there are 57,760 acres of prairie habitat.

In Wyoming, the swift fox is considered a common resident and uses prairies in the eastern plains, agricultural areas, irrigated native meadows, and the banks of roads and railroads.

Aquatic species that warrant coal development consideration are the northern leopard frog and Yellowstone cutthroat trout. The northern leopard frog is widespread and can inhabit a variety of aquatic habitats, but specific location data are limited. Degradation of water quality and aquatic habitats are the greatest conservation concerns. There are 6,410 acres (2,600 acres in Sheridan County and 3,810 acres in Campbell County) under Alternative A and 3,530 acres (in Campbell County) under Alternative B of combined riparian, wet meadow, and water habitats in the CDPAs. Only 210 riparian acres and 320 wet meadow acres are in the RFD area. Yellowstone cutthroat trout has the potential to occur in Sheridan County, upstream of the Alternative A CDPA, in Big Horn Mountain streams in the Tongue River drainage.

Big game species expected to occur in suitable habitats throughout the CDPAs are pronghorn, white-tailed deer, and mule deer. Pronghorns are unique to the western plains of North America and inhabit grasslands and semidesert shrublands. In Wyoming, mule deer occur in mountains and associated foothills, broken hill country, and prairie grasslands and shrublands; white-tailed deer are present, concentrated on major river corridors, shrubby riparian, and associated irrigated agricultural lands. Elk formerly ranged over much of central and western North America. Suitable elk habitat occurs throughout the state, but occupancy is limited primarily to the Rochelle Hills herd in the southeast corner of Campbell County and the Big Horn mountain herd in western portion of Sheridan County during hard winters.

#### ***Direct and Indirect Impacts***

##### *Analysis Methods*

###### Assumptions

- The area evaluated for indirect effects (mining) on most wildlife species is the RFD area and the area for indirect leasing effects is the CDPAs.
- Short- and long-term surface disturbance are assumed to occur in vegetation types, in proportion to the availability of these vegetation types, in the RFD area. Affected acreages for vegetation types are not absolute.
- Because of the migratory nature and relative mobility of some wildlife species, they are affected by actions on non-BLM-administered land more than other species. In the case of migratory species, effects on winter and migration habitats could adversely affect the viability of some species. Winter and migration habitats are assumed to be at least as important to long-term viability of these species as breeding and nesting habitats.
- The USFWS or State could designate additional wildlife to be of high interest, as additional data are collected and evaluated. These species would be managed as discussed under the alternatives.
- The Ute ladies'-tresses orchid is not known in the CDPAs but typically occurs in riparian and wetland habitat. Plant species of high federal or State interest that are present or with the potential to be present in riparian and wetland habitats could be affected by water quality or water use in the RFD area.
- Actions that reduce the threat of establishment or spread of invasive species directly benefit plant species of high federal or state interest. IM 2006-073 (BLM 2006) establishes policy and guidance for the use of certified weed seed-free products and mulch in restoration projects on public lands.

- As more monitoring and survey data become available, it is possible that populations of plant species of high federal or state interest could be found.
- All known raptor nests from the BLM's GIS database were used in the analysis. Nests of unknown raptor species were analyzed as golden eagle nests, when in trees, and as ferruginous hawk nests, when on the ground.
- Unsuitability screening will be applied at the time of lease application, using current scientific data, such as those for nest locations and wildlife habitat.
- There are no direct impacts on state or federal species, based on planning level decisions, to determine areas as acceptable or unacceptable for consideration for coal leasing; however, the impact analysis below identifies indirect effects, based on foreseeable leasing and mining.
- The BLM, in cooperation with State and other federal wildlife agencies, is responsible for managing habitat quality, suitability, and usability, whereas the WGFD and the USFWS have primary authority for managing wildlife populations; therefore, this analysis relies primarily on vegetation changes and loss of habitat use due to disruptive activities to estimate effects on wildlife habitats.
- High-quality habitats foster healthy and abundant biological communities appropriate to those habitats.
- The quality and quantity of crucial winter range and parturition range and migration corridors are generally considered to be the limiting factors on big game populations in the CDPAs. The ability of these areas to support wildlife populations is a factor in determining population levels.
- Natural variability in wildlife health, population levels, and habitat conditions will continue. Periods of mild or severe weather and outbreaks of wildlife disease or insects and plant diseases that affect habitat can also affect wildlife population levels.
- The BLM uses best available information, peer-reviewed science, management and conservation plans, research, and BLM directives to guide fish, aquatic species, and wildlife habitat management.
- Delineations of important wildlife habitats, such as occupied grouse leks, big game crucial winter ranges, and raptor nests, will be modified, based on habitat monitoring, wildlife population surveys, and other information provided by industry, the BLM, and the WGFD.
- The factors with the greatest impact on vegetation and soil health are the introduction and expansion of invasive plants species, surface-disturbing activities, large grazing ungulates,[7] and large-scale catastrophic events, such as wildfire and drought.
- Precipitation levels and soil characteristics, namely high saline soils with minimal soil structure, are the dominant limiting factors affecting reclamation potential.
- Short-term effects on vegetation will be the most prevalent at any given time, depending on reclamation timing and effectiveness. Longer term effects on vegetation will occur less often but will affect plant communities longer.
- The effects of surface disturbance will affect a fraction of the total acres projected under management decisions, depending on the type (short- versus long-term) and timing of disturbance.
- Riparian and wetland systems comprise only a small portion of lands but offer more species and diversity than any other land type.

Indicators

- Acres acceptable for further consideration for leasing (CDPAs) and future development (RFD area) in wetland and riparian communities

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[7] Hoofed animals, such as cattle and sheep

- Acres acceptable for further consideration for leasing (CDPAs) and future development (RFD area) in listed species habitat
- Acres acceptable for further consideration for leasing (CDPAs) and future development (RFD area) in potential migratory bird nesting habitat
- Acres acceptable for further consideration for leasing (CDPAs) and future development (RFD area) in potential habitat for species of state interest.

*Impacts Common to All Alternatives*

New leases would most likely be near existing leases, and development and coal mining would proceed west from existing mine disturbance in the coal development potential areas. Riparian and wet meadow vegetation communities comprise less than 1 percent of the RFD area and so would have minor impacts associated with potential coal development. Wetlands and riparian communities would continue to be evaluated under the multiple use screen.

Formal wetland inventories would be conducted as part of the process of obtaining a surface mining permit. In Wyoming, once a wetland delineation has been verified, it is made a part of the mine permit document. A reclamation plan is created to incorporate the replacement of at least equal types and number of jurisdictional wetland acreages. Disturbed non-jurisdictional wetlands would be restored as required by the authorized federal or State agency and would have to be approved before mining operations could be conducted on the areas that are leased.

The alternatives do not differ in their protection approach for biological resources. Site-specific surveys for each lease area and appropriate perimeters would be part of the mine permitting process if the tracts are leased. This would include appropriate surveys for BLM special status species, coordination with state and federal wildlife agencies, creation of a mining plan that could include site-specific mitigation, and habitat restoration.

Mining impacts are both short term (until successful habitat restoration is achieved) and long term (persisting beyond successful restoration). Short-term impacts include road kills by mine-related traffic, injury or mortality of individual species, restrictions on wildlife movement created by fences, spoil piles, and pits, displacement of wildlife from mining areas (including abandonment of nests or nesting and breeding habitat for birds), increased competition between animals in areas next to mining operations, and increased noise, dust, and human presence.

Displaced animals may find equally suitable habitat that is not occupied by other animals or may occupy poorer quality habitat than that from which they were displaced. Longer term impacts include alterations in topography and vegetation, particularly the reduction in shrub density and introduction of invasive plant species, and could cause a decrease in vegetation diversity and changes to wildfire characteristics. Impacts on each species would be addressed and mitigated at the project level.

Although the amount of area acceptable or unacceptable for further consideration for leasing differs between the two alternatives, the coal RFD area is the same; therefore, the extent of potential mining impacts on special status wildlife is anticipated to be the same during the life of the SEIS/RMPA. **Table 3-12** provides areas that would be determined unsuitable in the CDPA and RFD area, with exceptions for BLM special status species. Final unsuitability would be determined as part of the screening process, when coal leases are requested and use best available science.

**Table 3-12**
**Acres Identified in the CDP Areas and RFD Area Under Special Status Species Criteria**

| Unsuitability Criterion Number and Wildlife Resource | Acres CDPA Alternative A (Sheridan County) | Acres CDPA Alternative A (Campbell County) | Acres CDPA Alternative A (Total) | Acres CDPA Alternative B | Acres in the Coal RFD Area |
|---|---|---|---|---|---|
| 11. Bald eagle nests | 5,010 | 1,670 | 6,680 | 1,670 | 0 |
| 11. Golden eagle nests | 2,710 | 20,023 | 22,733 | 12,066 | 3,060 |
| 12. Eagle winter roosts | 4,331 | 0 | 4,331 | 0 | 0 |
| 15. Burrowing owl habitat | 5,372 | 9,082 | 14,454 | 6,753 | 350 |
| 15. Greater Sage-Grouse priority habitat management area (PHMA) | 0 | 2,964 | 2,964 | 0 | 0 |
| 15. Greater Sage-Grouse general habitat management area (GHMA) | 446 | 2,349 | 2,795 | 1,401 | 374 |
| 15. Swift fox habitat | 5,372 | 9,082 | 14,454 | 6,753 | 350 |
| 15. Fish population streams (quarter-mile buffer) | 19,133 | 85,673 | 104,806 | 65,513 | 13,897 |
| 15. Elk crucial winter range | 0 | 2,331 | 2,331 | 1,954 | 160 |
| 15. Elk calving areas | 0 | 2,346 | 2,346 | 25 | 0 |
| 15. Sharp-tailed grouse lek habitat (quarter-mile buffer) | 1,490 | 986 | 2,476 | 735 | 100 |

Sources: BLM GIS Data 2019; WGFD GIS Data 2018

Unsuitability criteria would be applied at the time of lease application and would use current best available science. Acreages above are examples of acres determined unsuitable. Exceptions to unsuitability may occur; see **Appendix A**, Coal Screening Report.

### *Federal Threatened and Endangered Species (Criterion 9)*

Presently there is no critical habitat or habitat of essential value (as determined by the USFWS) where the presence of threatened or endangered species has been scientifically documented in the Alternative A CDPA. The threatened Ute ladies'-tresses orchid has potential to occur in the CDPAs in riparian or wetland habitats. Northern long-eared bats are unlikely to be affected by potential coal leasing or coal development due to lack of preferred habitat and no known roost or hibernacula sites. If there is potential for federally listed species presence in a coal project site, appropriate surveys for species and their suitable habitat would occur. If identified, ESA Section 7 consultation would be initiated. This would ensure that coal mining would not jeopardize threatened and endangered species at the project level.

*Bald and Golden Eagle Nests (Criterion 11) and Roosts (Criterion 12)*

Indirect impacts on raptors, including bald and golden eagles, would be avoided or minimized through surveys and consultation with appropriate federal and state wildlife agencies. Eagle nest sites and roosts are present in the Alternative A CDPA; the Alternative B CDPA contains fewer nest sites and no winter roosts. Alternative B reduces potential effects from potential coal leasing, compared with Alternative A. Presently there are a few golden eagle nests and no identified eagle winter roosts sites in the RFD area. Protection for eagles would be adjusted for potential mining activities, based on site-specific information through coordination with, and written approval from, the USFWS. One potential mitigation option is that active golden eagle nests may be relocated prior to coal mining.

*Migratory Bird Species of High Federal Interest (Criterion 14)*

Presently the USFWS does not identify any migratory birds of high federal interest in the BFO; however, BLM special status species could become of high interest and, therefore, are considered for land management decisions, including coal development. Indirect impacts from potential coal leasing and development are habitat loss, reduced reproductive success through nest disturbance or loss, and injury or mortality from collision with vehicles or coal infrastructure. Most special status migratory birds would be able to avoid direct impacts due to their mobile nature.

Surveys for raptor nests would be made prior to coal leasing. If nests are identified, then coordination with State and federal wildlife agencies to establish mitigation would result. For example, in accordance with USFWS recommendations, ferruginous hawk nests could be moved or artificial nests would be installed away from the mine.

Management actions focus on maintaining or increasing the viability and biological integrity of migratory bird foraging and nesting habitats in the CDPAs. Prairie obligate species, such as loggerhead shrike and mountain plover, could be affected through coal development in prairie habitats. Prairie habitats comprise 398,360 acres under Alternative A (51,230 acres in Sheridan County and 347,130 acres in Campbell County), and 267,880 acres under Alternative B CDPA. In the RFD area, 57,760 acres of prairie habitats occur. Similarly, sagebrush obligate species, such as sage thrasher, Brewer's sparrow, and sage sparrow, could be affected by mining in 50,890 sagebrush acres in the RFD; they could be affected by leasing in the 295,200 sagebrush acres (15,120 in Sheridan County and 280,080 acres in Campbell County) acceptable for further consideration for leasing under Alternative A and 199,000 sagebrush acres acceptable for further consideration for leasing under Alternative B. Since Alternative A has more prairie and sagebrush acres acceptable for further consideration for leasing, Alternative A could result in more potential impacts on prairie and sagebrush obligate migratory birds beyond the life of the RMP, compared with Alternative B; however, over the next 20 years the reasonably foreseeable coal development is not anticipated to differ under either alternative.

*Species of High State Interest (Criterion 15)*

Indirect impacts on burrowing owls from coal mining could include collapsing burrows, habitat loss, displacement from habitat, and disturbance during sensitive breeding or wintering seasons. Under criterion 15, burrowing owl habitat, including prairie dog colonies, would be screened as unsuitable with exceptions. The black-tailed prairie dog is important to support burrowing owls for burrow creation. As described under effects common to all alternatives, further site-specific environmental analysis would occur prior to coal leasing and would address impacts and protection measures for burrowing owls. Alternative A could result in more potential impacts on burrowing owls beyond the life of the RMP; however reasonably foreseeable coal development is not anticipated to differ under either alternative (see **Table 3-12**).

Should areas be leased, mined, and reclaimed, alterations in the topography and vegetative communities would likely result in such changes in species composition from pre-mine conditions. Until sagebrush returns to its pre-mining density levels, there would be a reduction in potential habitat for wildlife species associated with sagebrush habitat in the RFD area. When an application for a new coal lease or lease modification is submitted, the BLM will determine whether the lease application area is unsuitable for all or certain coal mining methods, pursuant to 43 CFR 3461.5 and the screening criteria.

Approximately 50,890 acres of sagebrush habitat are in the RFD area under both alternatives. Coal development could degrade Greater Sage-Grouse habitat and indirectly affect habitat quality for this species. Intact sagebrush shrublands in northeast Wyoming are increasingly limited, and any amount of additional fragmentation has the potential to adversely affect associated wildlife and contribute to an overall shift in vegetation communities toward a grassland-dominated system; therefore, potential disturbance to sagebrush communities from mining could have greater impacts than in other parts of the state.

No new coal lease applications in PHMA (core population areas and core population connectivity corridors) are reasonably foreseeable. Mining would expand from the west of existing leases; PHMA is in the eastern portion of the Campbell County CDPAs, and there are no PHMA in the RFD area.

The BLM will review individual lease applications, in consultation with the WGFD, and will identify specific mitigation regarding Greater Sage-Grouse. The adverse impacts would be minor for Greater Sage-Grouse, as development would be unlikely to occur within PHMA (core population areas and core population connectivity corridors). Also, coordination with WGFD for site-specific mitigation would minimize adverse impacts in the remainder of Greater Sage-Grouse habitat.

Alternative A has more sagebrush habitat and 2,964 acres of PHMA in Campbell County acceptable for further consideration for leasing than Alternative B (no acres of PHMA). Similar to the situation for sagebrush-obligate migratory birds, Alternative A could result in more potential impacts on sagebrush-dependent Greater Sage-Grouse from leasing and mining beyond the life of the RMP, compared with Alternative B.

Swift foxes are considered common throughout Wyoming but are of special State interest. Under criterion 15, swift fox habitat would be considered for unsuitability screening and require coordination with WGFD for any coal mining in identified swift fox habitat. Indirect effects from coal development are habitat loss, fragmentation, and degradation until site reclamation restores habitats to pre-mining conditions. Increased human presence and traffic associated with mining operations could displace swift fox, result in injury or mortality from vehicle collisions, or disrupt natural behaviors. Acres of potential swift fox habitat, based on prairie dog colony habitat, occur in the RFD area; this could change over time as more accurate habitat mapping and site-specific surveys are conducted.

Alternative A would make more swift fox habitat acceptable for further consideration for leasing than Alternative B, which could result in more potential impacts on swift fox beyond the life of the SEIS/RMPA; however, reasonably foreseeable coal development is not anticipated to differ under the two alternatives, as development would be contained within the RFD area.

In the screening process for unsuitability of coal development, the BLM would take into consideration elk crucial winter range, parturition areas,[8] and migration corridors, pronghorn antelope crucial winter range, and mule deer crucial winter range. There are no acres of pronghorn antelope or mule deer crucial winter range or elk migration corridors in the CDPAs; there are no elk calving areas in the RFD area. Eastern Wyoming winters typically are not severe enough for snow depths to limit big game movements. Impacts on big game populations are expected to be minor; this is due to the small RFD area, future coal development occurring in or near existing areas of coal development disturbance, and the application of criterion 15 to protect species of high State interest. Alternative A has higher potential for impacts on elk, with more habitat acceptable for further consideration for leasing, although it is not reasonably foreseeable during the life of the SEIS/RMPA.

Indirect effects on sharp-tailed grouse are similar to those on Greater Sage-Grouse. Due to unsuitability criterion 15, coordination with WGFD and requiring a mitigation plan would reduce adverse impacts from coal leasing and mining on sharp-tailed grouse at the project-level.

Fish streams could be deemed unsuitable, with exceptions, under criterion 15. Exceptions could occur in coordination with WGFD and with stipulations to protect, restore, or mitigate water resources at the individual lease application level. This would ensure the conservation of aquatic species.

Alternative A has higher potential for impacts on aquatic species than Alternative B, as it has more acres of aquatic habitat acceptable for further consideration for leasing. The Yellowstone cutthroat trout could be present in Sheridan County, for Alternative A CDPA only. No impacts on cutthroat trout are anticipated, as neither coal leasing nor development are likely in Sheridan County.

Other special status species of high interest to the State, including amphibians (northern leopard frog), reptiles, and plants, would be considered during site-specific analysis for lease applications and prior to coal mining development. As sites are surveyed and species of high interest are identified, the BLM would require adequate protection, mitigation, and reclamation planning prior to authorization.

#### *Cumulative Impacts*

Cumulative impacts would be the same as those described in Sections 4.4.3, 4.4.5, 4.4.6, 4.4.7, 4.4.8, and 4.4.9 of the 2015 Proposed RMP/Final EIS and Section 4.1.1, Coal Development, Section 4.2.8, Vegetation, Wetlands, and Riparian Areas, and 4.2.9, Wildlife and Fisheries, of the Wright Area Final EIS (BLM 2015, 2010).

The 2015 Proposed RMP/Final EIS identified up to 195,700 acres of maximum disturbance, while the revised RFD identified up to 36,620 acres of surface disturbance. This is 22 percent of the surface disturbance analyzed for cumulative impacts in the 2015 Proposed RMP/Final EIS, so the extent of impacts would decrease.

The 2015 Proposed RMP/Final EIS provides an in-depth cumulative effects analysis for Greater Sage-Grouse (see Section 4.4.9.9, Greater Sage-Grouse Cumulative Effects Analysis for the Buffalo Planning Area [BLM 2015]). Coal development is likely to affect nesting, brood rearing, and winter habitat. Sagebrush shrublands are the predominant vegetation type in the RFD area and are increasingly limited in northeastern Wyoming. The loss or degradation of 50,890 acres of sagebrush habitat could be significant to the already at-risk Powder

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[8] Birthing areas

River basin population; however, through the State's Greater Sage-Grouse conservation strategy, local extirpation is unlikely.

Mining in the RFD area would not affect the overall regional raptor and migratory bird populations, due to their mobile nature and the availability of habitat at the landscape scale; however, potential habitat loss in the RFD area of 57,760 prairie and 50,890 sagebrush acres could contribute to loss or degradation of foraging habitat, when combined with other actions, such as urbanization and oil and gas development.

In general, adverse impacts on riparian-wetland systems are a product of surface-disturbing activities associated with mineral resource development, motorized vehicle use, road construction, and agricultural land uses. Surface-disturbing activities, water depletions, changes in stream hydrology, increased sedimentation, changes in water quality (including clarity), and introduction of invasive species can adversely affect fish, amphibians, and aquatic species. The primary means by which aquatic-dependent species could be affected are surface development (e.g., mining and urbanization), loss of sufficient upland and riparian/wetland vegetation that increases sedimentation, barriers to fish passage, discharged water, and stormwater runoff.

Cumulative impacts result from actions on adjoining lands that affect habitat availability and levels of disturbance to special status wildlife. The greatest factor influencing biological resources in the CDPAs are scattered landownership. Because most of the species of concern are wide ranging, activities on adjoining landownerships could diminish or could benefit management on public lands, depending on the activities.

The BLM anticipates coal development only in the RFD area, and future coal leasing would be most likely next to the western boundaries of existing leases. The intermingling of private, state, and US Forest Service (USFS) lands on BLM-administered lands throughout the CDPAs ensures that activities outside of the BLM's control would continue.

Surface-disturbing activities in vegetation communities would continue on adjacent private, State of Wyoming, and USFS lands. Alternative A has more wildlife habitats (such as sagebrush, riparian, wetlands, and prairie) acceptable for further consideration for leasing, which, in the long term, may result in larger potential disturbances to these habitats, compared with Alternative B; therefore, Alternative A may contribute to more cumulative effects over the long term; however, based on foreseeable coal development, the alternatives would not significantly differ during the life of the SEIS/RMPA.

## 3.6 UNAVOIDABLE ADVERSE IMPACTS

Section 102(C) of NEPA mandates disclosure of "any adverse environmental effects which cannot be avoided should the proposal be implemented." These are impacts for which there are no mitigation measures or impacts that would remain, even after mitigation measures are implemented. Implementing this SEIS/RMPA and subsequent activity- or project-specific coal mining would result in unavoidable adverse impacts on some resources. These impacts are described in detail above and are summarized herein.

As discussed under irreversible and irretrievable impacts, below, the specific nature and extent of the implementation-level impacts cannot be clearly defined, due to unknowns about site-specific implementation and associated mitigation measures.

In general, development and surface-disturbing activities associated with coal extraction would result in unavoidable adverse impacts, including soil compaction and erosion, soil homogenization, loss of vegetation cover, spread of noxious weeds, disturbance to and displacement of wildlife, visual intrusions on the landscape, and potential loss of cultural or paleontological resources.

## 3.7 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Section 102(2)(C) of NEPA and Section 1502.16 of the CEQ regulations for implementing NEPA require that the discussion of environmental consequences include a description of ". . . any irreversible or irretrievable commitment of resources which would be involved in the proposal should it be implemented."

Coal extraction from lands acceptable for further consideration for leasing would result in the irreversible and irretrievable loss of those coal reserves. In addition, coal mining development and surface disturbance would have potentially irretrievable and potentially irreversible effects on vegetation, wildlife habitat, and livestock grazing if reclamation proves unsuccessful. Irreversible effects on soils and water quality could occur, depending on the implementation of mitigation measures and their efficacy.

## 3.8 RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

Section 102(C) of NEPA requires a discussion of the relationship between local, short-term uses of the human environment and the maintenance and enhancement of long-term productivity of resources. Short-term is defined as anticipated to occur within 1 to 5 years of implementation of the activity. Long-term is defined as following the first 5 years of implementation but within the life of this SEIS/RMPA (projected to be 20 years).

Coal extraction and the resulting surface disturbance would result in various short-term adverse impacts, such as increased localized soil erosion or damage to wildlife habitat. Management actions and BMPs would minimize the effect of short-term uses and would reverse the change in the long term; however, coal extraction and the associated infrastructure could result in some long-term productivity impacts, regardless of reclamation.

# Appendix A

## Coal Screening Process

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## ATTACHMENT

1 Sample Private Landowner Letter

## ADDITIONAL INFORMATION

Responses to Landowner Letters Documented in the Decision File

# Appendix A. Coal Screening Process

## A.1 INTRODUCTION

As part of the land use planning process (regulated under 43 CFR 1600), surface management agencies are charged with screening public land resources through a series of criteria. This separates lands suitable for development of coal resources from those unsuitable, because of potential resource conflicts with coal development (43 CFR 3420.1-4(d)).

This appendix describes the screening process for coal resources undertaken by the BFO, complying with 43 CFR 3420.1-4(e)(1–4). The screening process informs potential land use decisions regarding acceptability for coal leasing under the alternatives analyzed in the BFO SEIS/RMPA.

The BLM used a coal screen developed for the 2001 RMP revision for the 2015 Proposed RMP/Final EIS, which authorizes federal coal resources in the planning area. The BLM updated coal potential data in 2001 for the 2015 Proposed RMP/Final EIS revision. To date, the BLM has issued 131,837 acres of BLM-administered federal coal for coal leases in the BFO planning area.

The coal screen described in this appendix provides updated information on coal potential and criteria resources in the BFO decision area since it was last screened in 2001.

## A.2 REGULATORY OVERVIEW

Federal coal resources are governed by Section 522(b) of the Surface Mining Control and Reclamation Act and the regulations at 43 CFR 3400 and 1600. One aspect of coal leasing governed under these regulations is land use planning (43 CFR 3420.1-4(d) and 1610.7-1) and the review of federal lands for suitability for coal leasing (43 CFR 3461). These regulations identify certain lands as categorically unacceptable for leasing because they contain significant values that conflict with coal development. These include components of the National Wildlife Refuge System, the National System of Trails, and incorporated cities, towns, and villages, among other entities. Other areas disqualified for leasing are critical habitat for threatened and endangered species and cultural resources listed on the National Register of Historic Places.

The regulations at 43 CFR 3420 govern the land use planning process as it pertains to coal, including the four-step screening process for identifying areas acceptable for further consideration for leasing (43 CFR 3420.1-4). Under this process, the BLM must complete the following:

- Identify coal with development potential—Lands determined to have development potential are considered acceptable for further consideration for leasing and are applied to the remaining coal screens. Lands determined to not have development potential are eliminated from further consideration for leasing.
- Apply unsuitability criteria—Lands with coal potential are assessed with procedures outlined in 43 CFR 3461. Lands with coal potential may be eliminated from further consideration from leasing if determined to be unsuitable without stipulation or exception.
- Analyze multiple use conflict—43 CFR 3420.1-4e (3) states that "multiple land use decisions shall be made which may eliminate additional coal deposits from further consideration for leasing, to protect resource values of a locally important or unique nature not included in the unsuitability criteria." Multiple use values may include possible oil and gas development and soil, forest, wildlife,

recreation, agriculture, and watershed resources. Lands with coal potential may be eliminated from further consideration for leasing where multiple uses conflict.

- Consult surface owners—This screen requires the BLM to consult with qualified surface owners whose land overlies federal coal with development potential. The BLM asks the qualified surface owners for their preference for or against offering the coal deposits under their land for lease. Lands with coal potential may be eliminated from further consideration for leasing, based on qualified surface owner preference.

The BLM will undertake additional analysis and consultation, as necessary, before it issues new leases.

## A.3 SCREENING PROCESS OVERVIEW

### A.3.1 Screen 1—Coal Development Potential

The BLM determined the Alternative B coal development potential area (CDPA) for the BFO using stripping ratios, where appropriate and available. The BLM used drill data from the Wyoming Oil and Gas Conservation Commission, where the BLM's own data were not available.

The adjustment of the Alternative B CDPA is based on coal quality and stripping ratio; that is, the cost to produce. Coal quality is measured partly by the British thermal unit (BTU) range at which it burns, with higher quality coal burning hotter; that is, at a higher BTU. Mines in the northern part of the decision area produce coal that burns in the 8,200 to 8,400 BTU range, the mines in the central part of the decision area produce in the 8,400 to 8,600 BTU range, and the mines in the southern part of the decision area produce in the 8,600 to over 8,800 BTU range.

To balance the cost of production and quality, and in keeping with the current pricing in the coal market, the BLM used stripping ratios of 4:1, 5:1, and 6:1 for mines in the northern, central, and southern parts of the decision area, respectively.

The BLM applied a stripping ratio of 4:1 to the area around the mines in the northern part of the decision area: the Rawhide, Eagle Butte, Wyodak, and Dry Fork mines. The BLM applied a stripping ratio of 5:1 to the area around mines in the middle part of the decision area: the Caballo, Belle Ayr, Cordero Rojo, and Coal Creek mines. Finally, The BLM applied a stripping ratio of 6:1 to the area around mines in the southern part of the decision area: the Black Thunder, School Creek, North Antelope/Rochelle and Antelope mines.

The stripping ratio is most accurate and most predictive near the western end of active mines. This is because this is where most drill data are collected, in anticipation of westward progression of mining activity. Where BLM data were sparse—notably, the east side of the Southern Mine Group—the BLM used Wyoming Oil and Gas Conservation Commission drill data to determine the availability of coal; the BLM modified the Alternative B CDPA to reflect these findings. Although there is coal on the eastern boundary of the Southern Mine Group, available data suggest what is available is not economic to develop. For this reason, the Alternative B CDPA boundary is farther west than previously identified.

### A.3.2 Screen 2—Unsuitability Assessment

The BLM BFO interdisciplinary team of resource specialists reviewed available data and solicited expertise from state and federal agencies to assess the applicability of each of the 20 unsuitability criteria to the decision area. **Table A-2** provides a detailed breakdown of each criterion, lands found unsuitable under each criterion, and total acreages identified and designated as unsuitable for coal development under each criterion.

For BLM-administered federal coal resources beneath state lands, the BLM will consult with the Wyoming governor's office during the governor's consistency review for the EIS, in accordance with 43 CFR 3420.1-7. The United States Forest Service screens and makes the allocation decision for federal coal beneath the Thunder Basin National Grassland surface; the BLM consults with that agency during lease actions.

### A.3.3 Screen 3—Evaluation of Multiple Land Use Decisions to Protect Other Resource Values and Land Uses

Within the range of alternatives analyzed in the BFO SEIS/RMPA, the BLM could eliminate additional coal deposits from further consideration for leasing. The BLM would do this to protect other resource values and land uses, where they are not protected under the 20 unsuitability criteria through coordination with other government agencies and organizations. Additional coal deposits can be eliminated from further consideration for leasing through site-specific analyses completed before lease sales. Because almost all BLM-administered federal coal deposits lie beneath lands owned or administered by other entities, the BLM will consult with those entities before eliminating the federal coal deposits beneath them from further consideration for leasing.

### A.3.4 Screen 4—Consultation with Qualified Surface Owners

Because almost all BLM-administered federal coal deposits lie beneath lands owned or administered by other entities, the BLM will consult with those entities before eliminating the federal coal deposits beneath them from further consideration for leasing.

The BLM sent letters to all identifiable private surface owners with parcels overlying BLM-administered federal coal resources in Campbell County only (Sheridan County was removed with the coal development potential Screen 1). The BLM requested that the surface owners confirm that they are qualified to express their preference on mining federal coal resources (see 43 CFR 3400.0-5[gg][1] and [2]). The BLM also asked that the surface owners respond with their preference for or against mining by other than underground methods—that is, surface mining—on the BLM-administered federal coal resources beneath their land. A sample of the letters sent to private surface owners can be found in **Attachment 1**.

In order to be a qualified surface owner in accordance with the regulations at 43 CFR 3400.0-5, the individuals must have the following characteristics:

- Hold legal or equitable title to the surface of split estate lands
- Have their principal place of residence on the land or personally conduct farming, or ranching operations on a farm or ranch unit to be affected by surface mining operations, or receive directly a significant portion of their income, if any, from such farming and ranching operations
- Have met the first two conditions for a period of at least 3 years, except for persons who gave written consent less than 3 years after they met the requirements

In computing the 3-year period, the BLM Authorized Officer should include periods during which the title was owned by a relative of such person by blood or marriage if, during such periods, the relative would have met the requirements of this section.

The BLM will verify qualified surface ownership and surface owner preference for or against mining by other than underground methods (surface mining) before issuing any lease for federal coal resources beneath privately owned parcels. No leases for surface mining will be issued without qualified surface owner consent.

There are 498,523 acres of private parcels overlying the Alternative B CDPA in Campbell County.

## A.4 COAL DEVELOPMENT POTENTIAL RESULTS

Total acres in the Alternative B CDPA are tabulated under **Table A-1**. This includes results from the four coal screens; it excludes those areas identified as unsuitable without exception (24,791 acres) and those lands removed during the multiple use screens (881 acres). The Alternative B CDPA is mapped in **Figure A-1.**

**Table A-1**
**Coal Resources in the Alternative B CDPA**

| Areas | Acres of BLM-Administered Federal Mineral Estate |
|---|---|
| Alternative B CDPA | 455,467 |
| Alternative B CDPA, excluding current federal coal leases | 323,630 |

Source: BLM GIS 2019

## A.5 UNSUITABILITY ASSESSMENT RESULTS

The acres designated unsuitable under each unsuitability criterion are tabulated under **Table A-2**; areas identified as unsuitable under each of the unsuitability criteria are mapped in **Figures A-2** through **A-8**. For each criterion, resources that trigger unsuitability are identified. (Note that the resources identified are not exhaustive of that type of resource in the decision area but are only those resources that overlie areas with coal potential identified under Screen 1 and that result in unsuitable designation.)

Acreages are not additive across the table because of overlapping resources, such as Wilderness Study Areas, which drive unsuitability also designated as Visual Resource Management Area 1 and therefore subject to both Criteria 5 and 6.

**Table A-2**
**Application of Unsuitability Criteria in the Alternative B CDPA**

| Criterion | Criterion Name and Applicable Resources in the Planning Area | Acres Unsuitable |
|---|---|---|
| Criterion 1 | Federal lands for preservation, such as for National Parks, National Wildlife Refuges, and Wilderness Areas: Cities (13,290 acres) | 13,290 acres |
| Criterion 2 | Federal lands within rights-of-way (ROWs) or easements or surface leases for residential, commercial, industrial, or other public purposes:<br>• Nonlinear ROWs—204 acres<br>• Linear ROWs—117 acres | 321 acres |
| Criterion 3 | Buffer zones along road ROWs and next to communities, public schools, occupied dwellings, churches, public parks, and cemeteries:<br>• Buildings (17,244 acres)<br>• County roads (2,033 acres)<br>• State highways—WY 59, WY 450 (773 acres)<br>• Interstate highways—I-90 (466 acres)<br>• US highway—US 16 (339 acres)<br>• Cemeteries (315 acres)<br>• Agency roads (12 acres) | 21,182 acres |

| Criterion | Criterion Name and Applicable Resources in the Planning Area | Acres Unsuitable |
|---|---|---|
| Criterion 4 | Wilderness Study Areas | 0 acres |
| Criterion 5 | Scenic areas | 0 acres |
| Criterion 6 | Scientific study | 0 acres |
| Criterion 7 | Historic lands and sites | 0 acres |
| Criterion 8 | Natural areas | 0 acres |
| Criterion 9 | Federally designated critical habitat for threatened and endangered species | 0 acres |
| Criterion 10 | State listed threatened and endangered species | 0 acres |
| Criterion 11 | Bald and golden eagle sites:<br>• Bald eagle nest buffers—(1,670 acres)<br>• Golden eagle nest buffers— (12,066 acres) | 13,736 acres |
| Criterion 12 | Bald and golden eagle roost and concentration areas | 0 acres |
| Criterion 13 | Falcon nesting sites | 0 acres |
| Criterion 14 | Migratory birds of high federal interest | 0 acres |
| Criterion 15 | Habitat for species of state interest:<br>• Greater Sage-Grouse leks—(1,407 acres)<br>• Sharp-tailed grouse leks—(735 acres)<br>• Burrowing owl habitat—6,753 acres<br>• Elk crucial winter range—1,954 acres<br>• Elk calving areas—25 acres<br>• Swift fox habitat—6,753 acres | 17,627 acres |
| Criterion 16 | 100-year floodplain | 0 acres |
| Criterion 17 | Municipal watersheds | 0 acres |
| Criterion 18 | Natural resource waters | 0 acres |
| Criterion 19 | Alluvial valley floors | 12,348 acres |
| Criterion 20 | State proposed criteria | 0 acres |

Source: BLM GIS 2019

## A.6 RESULTS OF MULTIPLE LAND-USE DECISIONS

In addition to the areas eliminated from further consideration for coal leasing by the unsuitability criterion under Screen 2, above, land use decisions to protect resources of high value to the public may eliminate additional coal deposits from further consideration. No lands or resource conflicts were identified in the 2015 Proposed RMP/Final EIS that would restrict coal development beyond the areas identified under the unsuitability criteria (Screen 2). **Table A-3** includes multiple use conflicts that the BFO decided not to remove as unacceptable for further consideration for coal leasing; it also shows the rationale behind the decisions.

The BLM considered air quality when completing the multiple-use screen. Existing data and modeling done for the 2015 Proposed RMP/Final EIS showed no air quality standards were exceeded, based on the national ambient air quality standards under the Clean Air Act; therefore, the BLM did not designate the resulting geographic area as not suitable for further leasing of coal.

There is presently insufficient data for an accurate wetland assessment in the Alternative B CDPA. Wetlands would be inventoried as part of the leasing application process, where the BLM would make a determination of unsuitability, in coordination with the US Army Corp of Engineers and the Wyoming Department of Environmental Quality.

### Table A-3
### Multiple Use Conflicts Not Recommended as Unacceptable for Coal Leasing[1]

| Resource Topic | Resource Potentially in Conflict with Coal | Reason for not Analyzing |
|---|---|---|
| Soils | Soils with depths less than 50 centimeters | Scattered distribution, with limited geographic extent |
| | Sandy and clayey soils | Scattered distribution, with limited geographic extent |
| | Reclamation resistant soil chemistries | Scattered distribution, with limited geographic extent |
| Grazing | Livestock allotments | Allotment acreages sufficient to accommodate limited development |
| Solid minerals | Salable mineral pits | 7 contracts in the Alternative B CDPA; no direct conflict anticipated |
| | Locatable mineral plans of operations | Two free use permits in the Alternative B CDPA; no direct conflict anticipated |
| | Uranium | No potential uranium areas in the Alternative B CDPA |
| | Wyoming Department of Environment Quality mining permits | 23 permits in the Alternative B CDPA; no direct conflict anticipated |
| | Active mining claims | No active claims in the Alternative B CDPA |
| Fluid minerals | Active wells | 663 wells in 27 unitized areas in the Alternative B CDPA; following resolution of IBLA 2018-203, the BLM determined that coal leases would suspend oil and gas activities where the two conflict. |

Source: BLM GIS 2019

[1]These resources may prevent coal development but require more detailed analysis than is supported to make that determination.

After close review of resources in the CDPA, and in consultation with state and federal agencies, the BLM recommended a number of resources as unsuitable for coal leasing, due to conflicts in use; therefore, the BLM eliminated them from further consideration for coal leasing under Screen 3.

In sum, 933 acres were excluded from leasing under this screen. Resources removed from further consideration because of their significance and potential conflict with coal development are a municipal airport (697 acres) and a special recreation management area (236 acres).

## A.7 RESULTS OF CONSULTATION WITH QUALIFIED SURFACE OWNERS

The BFO mailed letters to 372 private landowners who own property larger than 40 acres in the decision area. The BLM included an addressed, postage-paid envelope to encourage response. The 40-acre threshold was based on the qualification criterion that a significant portion of income should come from the parcel. Corporate landowners were included in those who were sent letters; this is because the parcels they own may likely provide significant income, even where there may not be principal residences on the property.

Letters were sent on January 30, 2019, requesting response by March 1, 2019, and requested verification of landowner qualifications, opinion on leasing federal coal beneath their surface (favor, against, and undecided), and inquiring if they have previously provided consent for surface mining (see example letter in **Attachment 1**). Results are listed in **Table A-4**; landowner response letters are included in the Decision File.

**Table A-4**
**Private Surface Owner Response**

| Surface Owner Consultation | Status | Letter Number | Percent Response | Acres Represented |
|---|---|---|---|---|
| Letter Delivery | Sent | 372 | — | 977,000 |
| | Delivered | 367 | 99 | 975,000 |
| | Returned by US Postal Service | 3 | 1 | 1,520 |
| Landowner response rate | Responses received | 160 | 43 | 472,000 |
| | Delivered without response | 207 | 56 | 504,000 |
| Landowner opinion on leasing | For | 66 | 18 | 218,000 |
| | Against | 45 | 12 | 112,000 |
| | Undecided | 41 | 11 | 87,000 |
| | Received, no response | 8 | 2 | 53,000 |

Source: BFO 2019

There is no significant opposition to mining in the areas with the highest likelihood of coal mining. The owners objecting to mining are mostly separated from active mines or are in areas having moderate to low development potential. No areas were made unsuitable, based on landowner response. Before potential leases are delineated, surface owners would again be contacted as to their preference for or against surface coal mining, in accordance with the BLM Coal Leasing Handbook.

## A.8 CONCLUSION

The information above describes the processes for and outcomes of the BLM's screening process to identify lands acceptable for further consideration for leasing, in accordance with federal regulations governing federal coal management and land use planning. The allocations resulting from this process are included in the alternatives considered in the BFO SEIS/RMPA. These allocations are intended to cover the entire coal potential area for the BLM-administered federal mineral estate in that document. This was done to allow future coal leasing decisions in these areas to proceed without a need to amend the decisions in the SEIS/RMPA. The BLM will undertake additional site-specific analyses and consultation, as necessary, before issuing new leases.

**Table A-5**
**Coal Screening Results**

| Coal Screen | Results | Acres |
|---|---|---|
| Coal screen #1 | Coal development potential | 481,139 |
| Coal screen #2 | No exception | 24,791 |
| | Exception | 34,826 |
| Coal screen #3 | Multiple use | 881 |
| Coal screen #4 | Consultation with landowners | 0 |

Source: BLM GIS 2019

## A.9 REFERENCE

BLM GIS. 2019. GIS data on file with the BLM's eGIS server, used for calculations or figures related to the coal development strategy. BLM, Buffalo Field Office, Wyoming.

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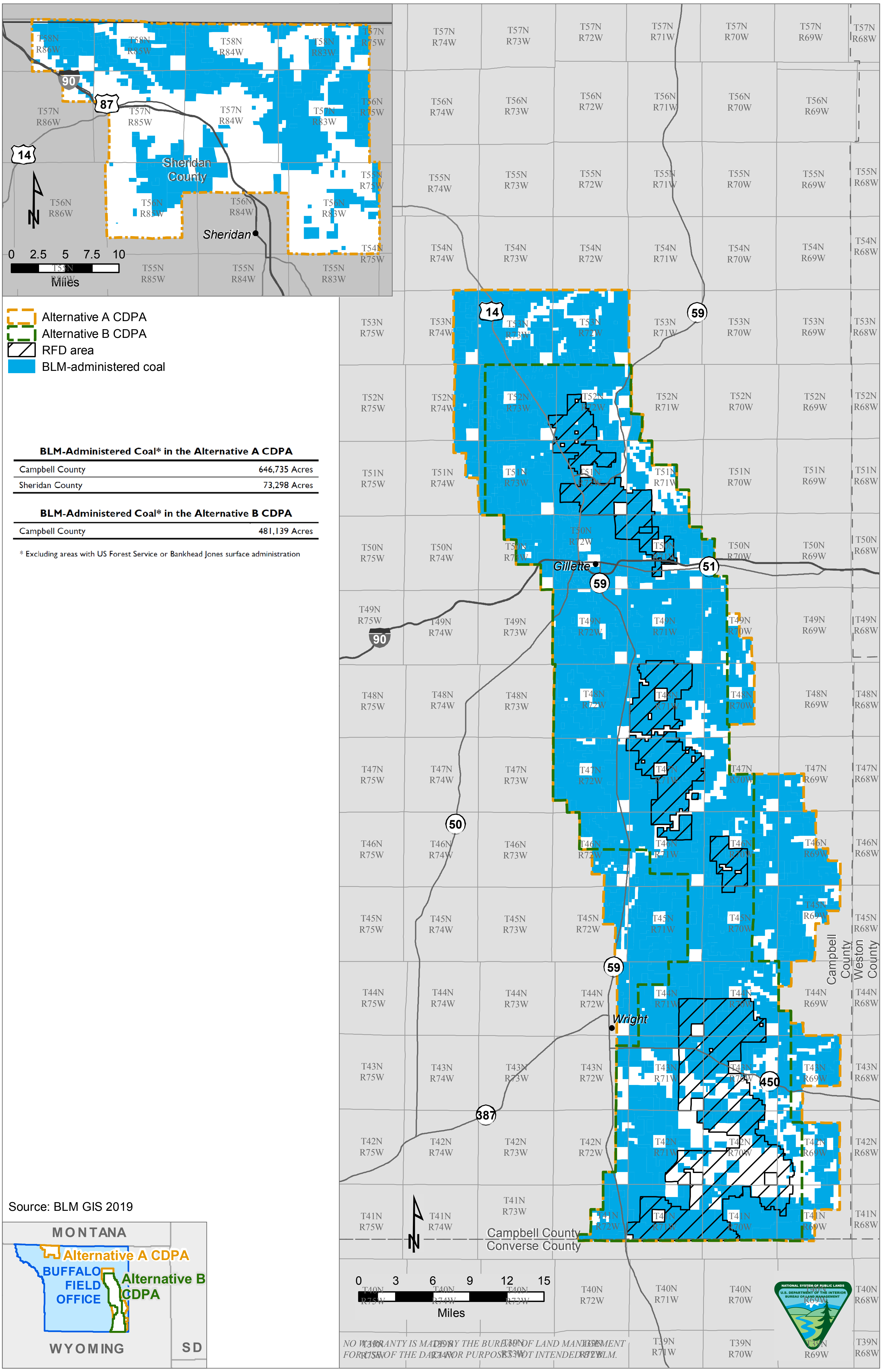
## Figure A-1
## Screen 1 Coal Development Potential



**BLM-Administered Coal* in the Alternative A CDPA**

| | |
|---|---|
| Campbell County | 646,735 Acres |
| Sheridan County | 73,298 Acres |

**BLM-Administered Coal* in the Alternative B CDPA**

| | |
|---|---|
| Campbell County | 481,139 Acres |

* Excluding areas with US Forest Service or Bankhead Jones surface administration

Source: BLM GIS 2019

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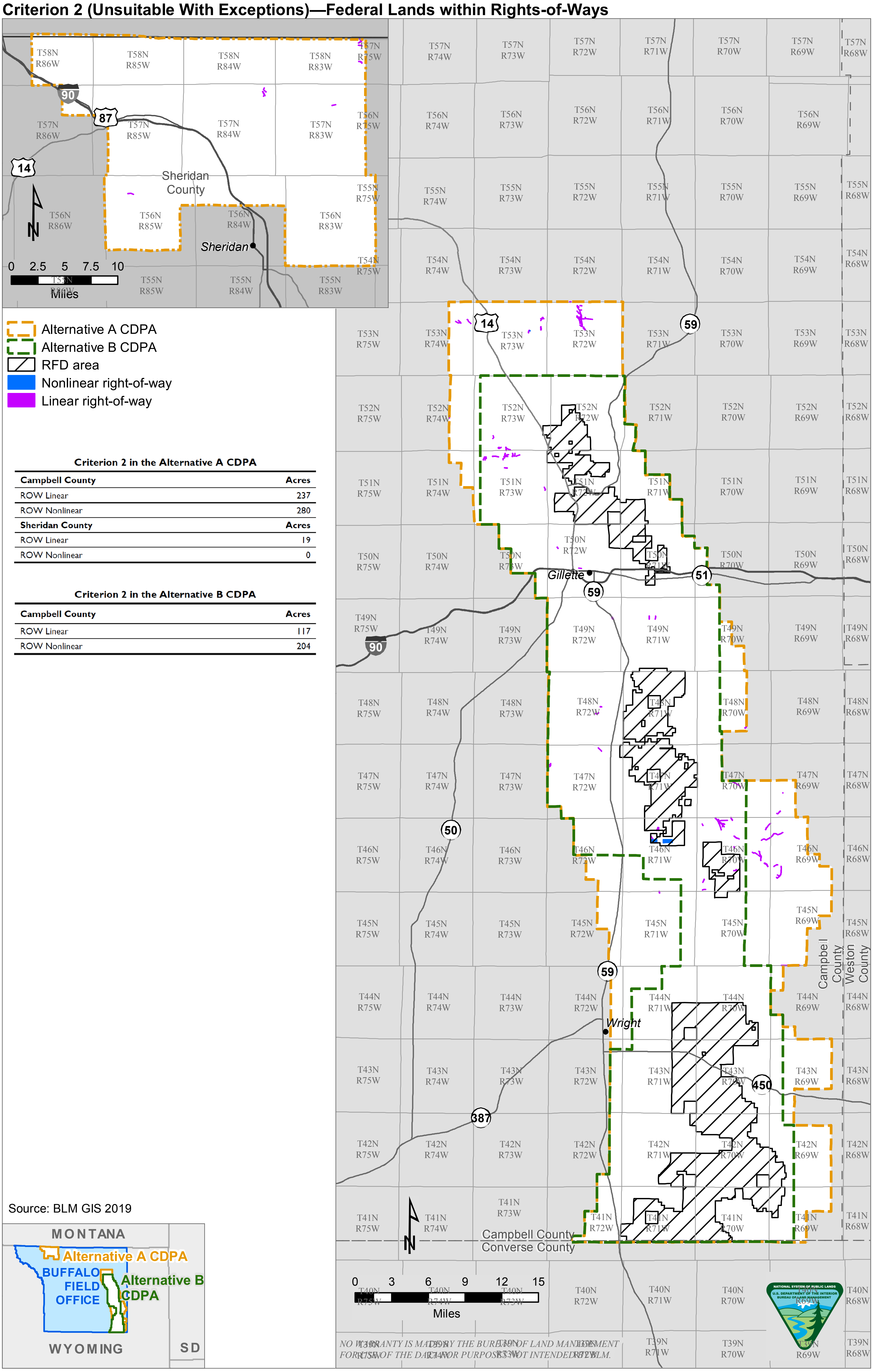
## Figure A-2
## Screen 2 Unsuitability Assessment:
## Criterion 2 (Unsuitable With Exceptions)—Federal Lands within Rights-of-Ways



**Criterion 2 in the Alternative A CDPA**

| **Campbell County** | **Acres** |
|---|---|
| ROW Linear | 237 |
| ROW Nonlinear | 280 |
| **Sheridan County** | **Acres** |
| ROW Linear | 19 |
| ROW Nonlinear | 0 |

**Criterion 2 in the Alternative B CDPA**

| **Campbell County** | **Acres** |
|---|---|
| ROW Linear | 117 |
| ROW Nonlinear | 204 |

Source: BLM GIS 2019

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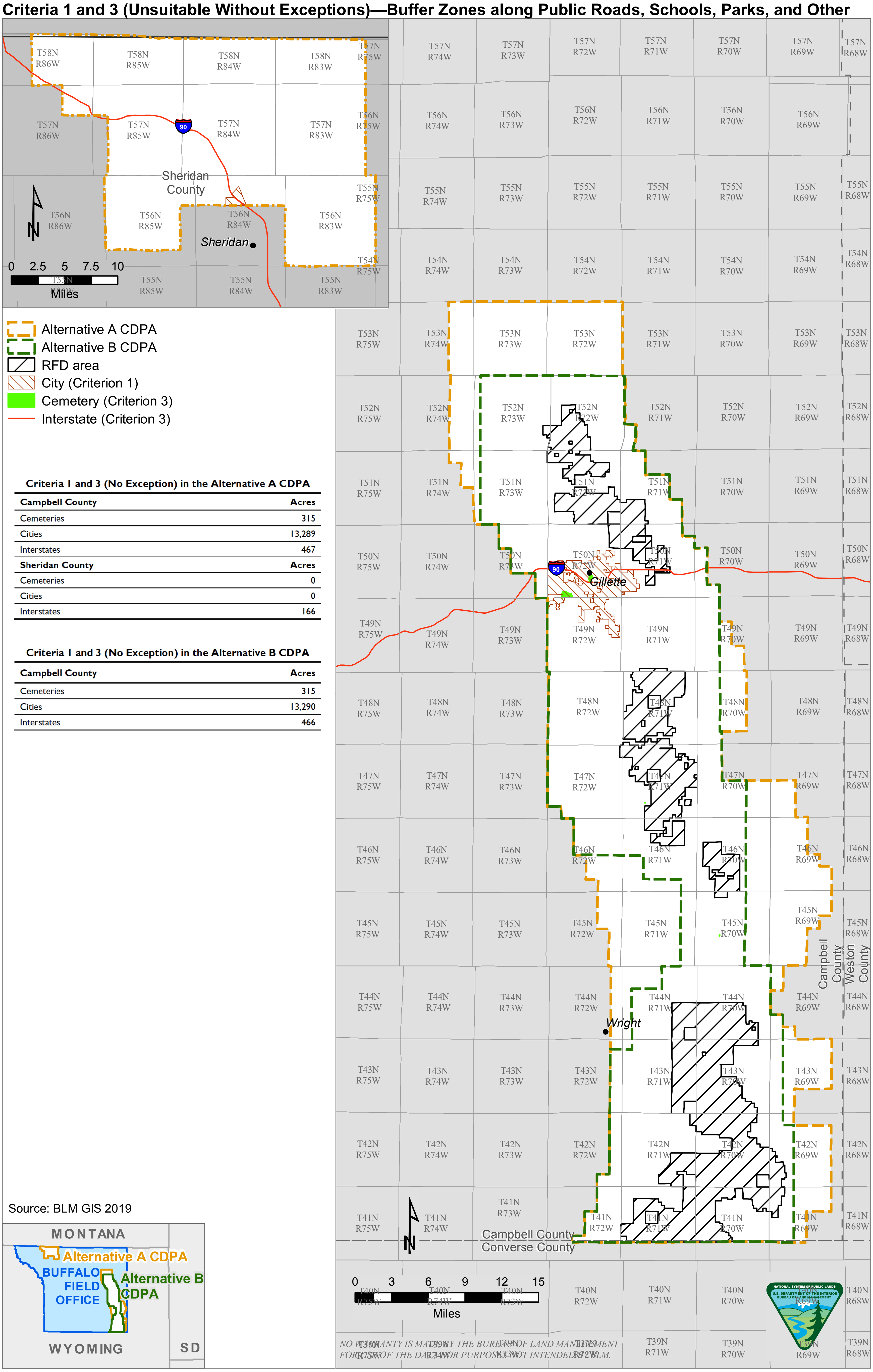
**Figure A-3**
**Screen 2 Unsuitability Assessment:**
**Criteria 1 and 3 (Unsuitable Without Exceptions)—Buffer Zones along Public Roads, Schools, Parks, and Other**



**Criteria 1 and 3 (No Exception) in the Alternative A CDPA**

| Campbell County | Acres |
|---|---|
| Cemeteries | 315 |
| Cities | 13,289 |
| Interstates | 467 |
| **Sheridan County** | **Acres** |
| Cemeteries | 0 |
| Cities | 0 |
| Interstates | 166 |

**Criteria 1 and 3 (No Exception) in the Alternative B CDPA**

| Campbell County | Acres |
|---|---|
| Cemeteries | 315 |
| Cities | 13,290 |
| Interstates | 466 |

Source: BLM GIS 2019

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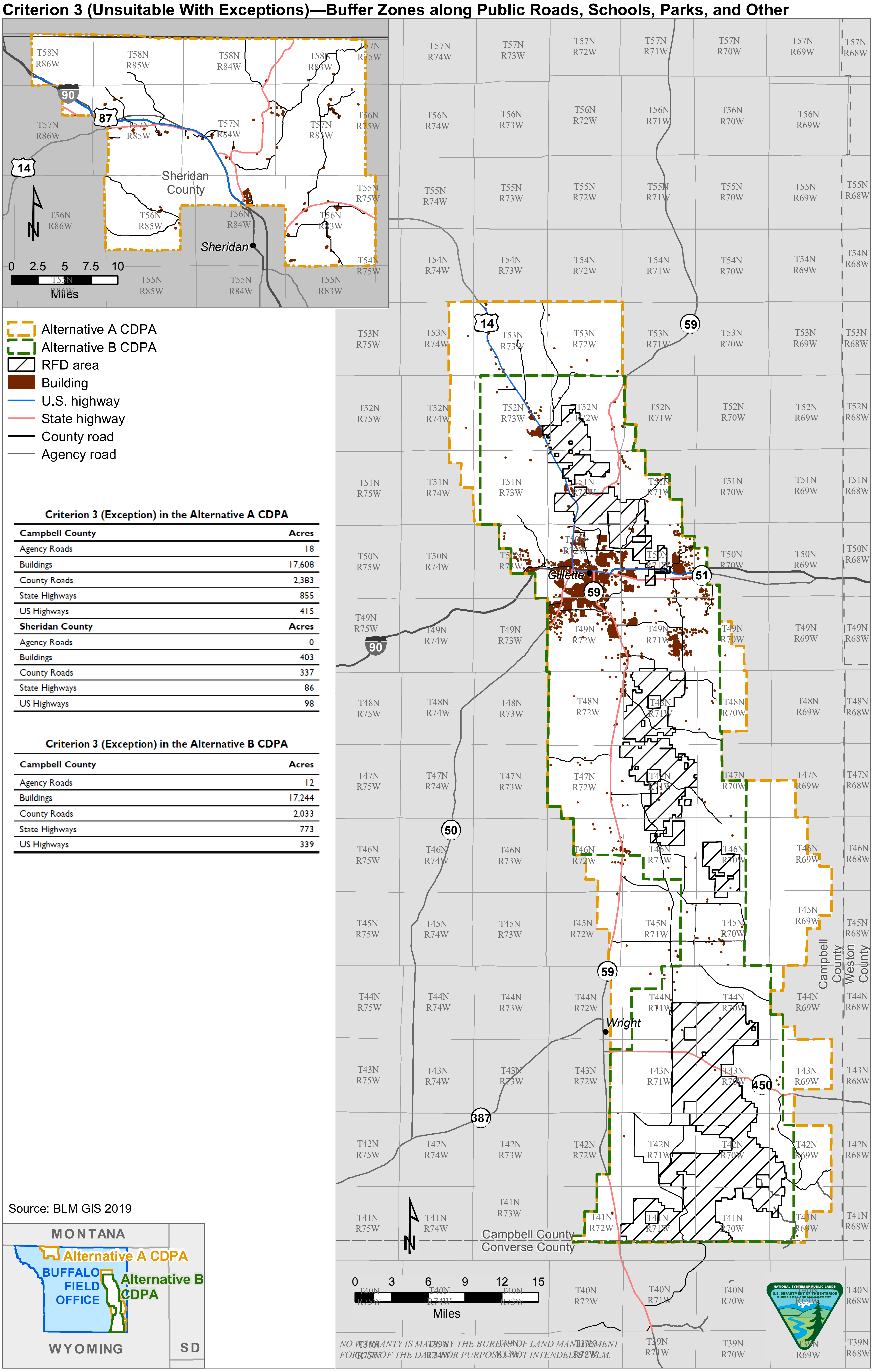
### Figure A-4
### Screen 2 Unsuitability Assessment:
### Criterion 3 (Unsuitable With Exceptions)—Buffer Zones along Public Roads, Schools, Parks, and Other



**Criterion 3 (Exception) in the Alternative A CDPA**

| Campbell County | Acres |
|---|---|
| Agency Roads | 18 |
| Buildings | 17,608 |
| County Roads | 2,383 |
| State Highways | 855 |
| US Highways | 415 |
| **Sheridan County** | **Acres** |
| Agency Roads | 0 |
| Buildings | 403 |
| County Roads | 337 |
| State Highways | 86 |
| US Highways | 98 |

**Criterion 3 (Exception) in the Alternative B CDPA**

| Campbell County | Acres |
|---|---|
| Agency Roads | 12 |
| Buildings | 17,244 |
| County Roads | 2,033 |
| State Highways | 773 |
| US Highways | 339 |

Source: BLM GIS 2019

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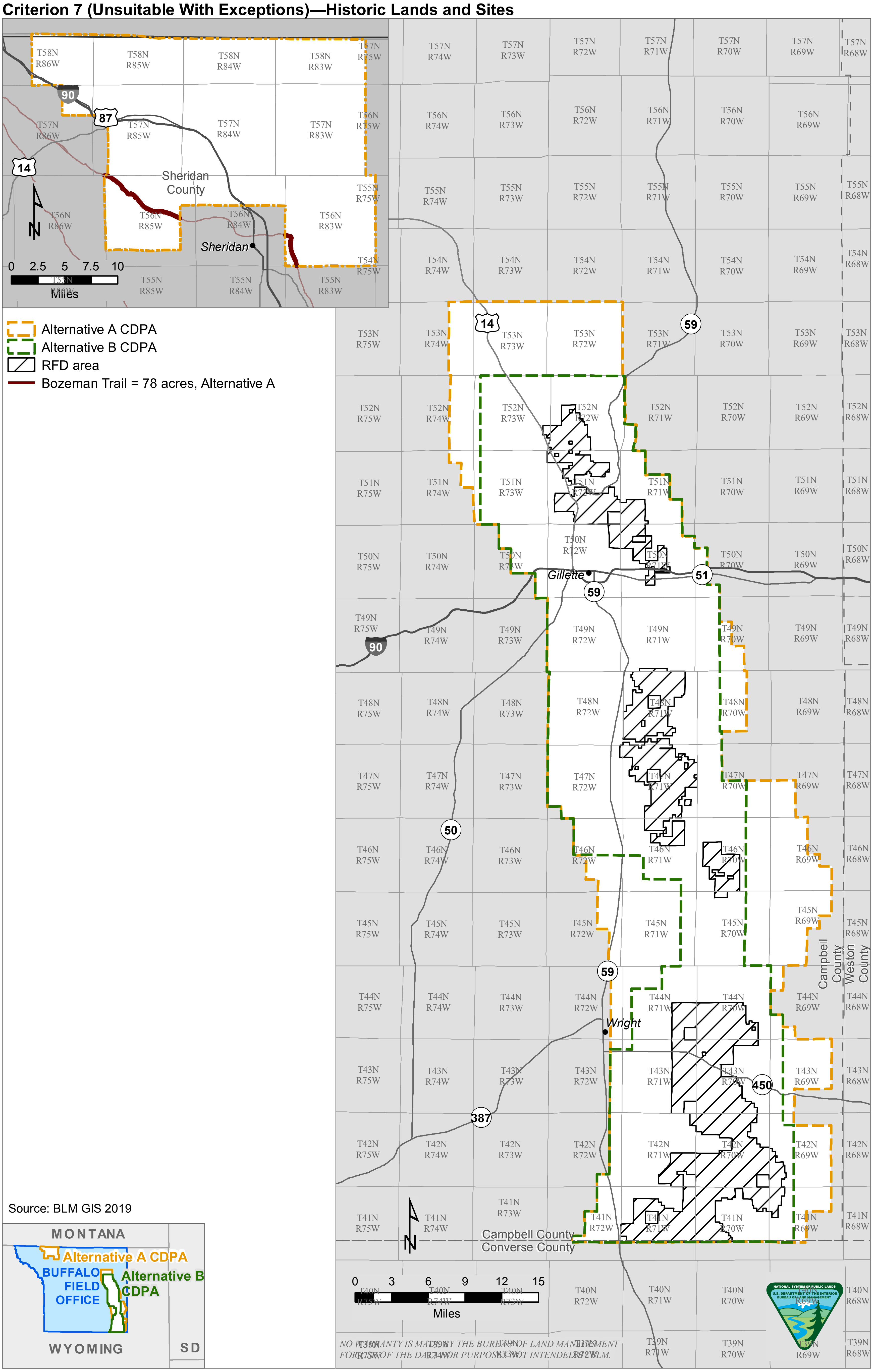
### Figure A-5
### Screen 2 Unsuitability Assessment:
### Criterion 7 (Unsuitable With Exceptions)—Historic Lands and Sites



Source: BLM GIS 2019

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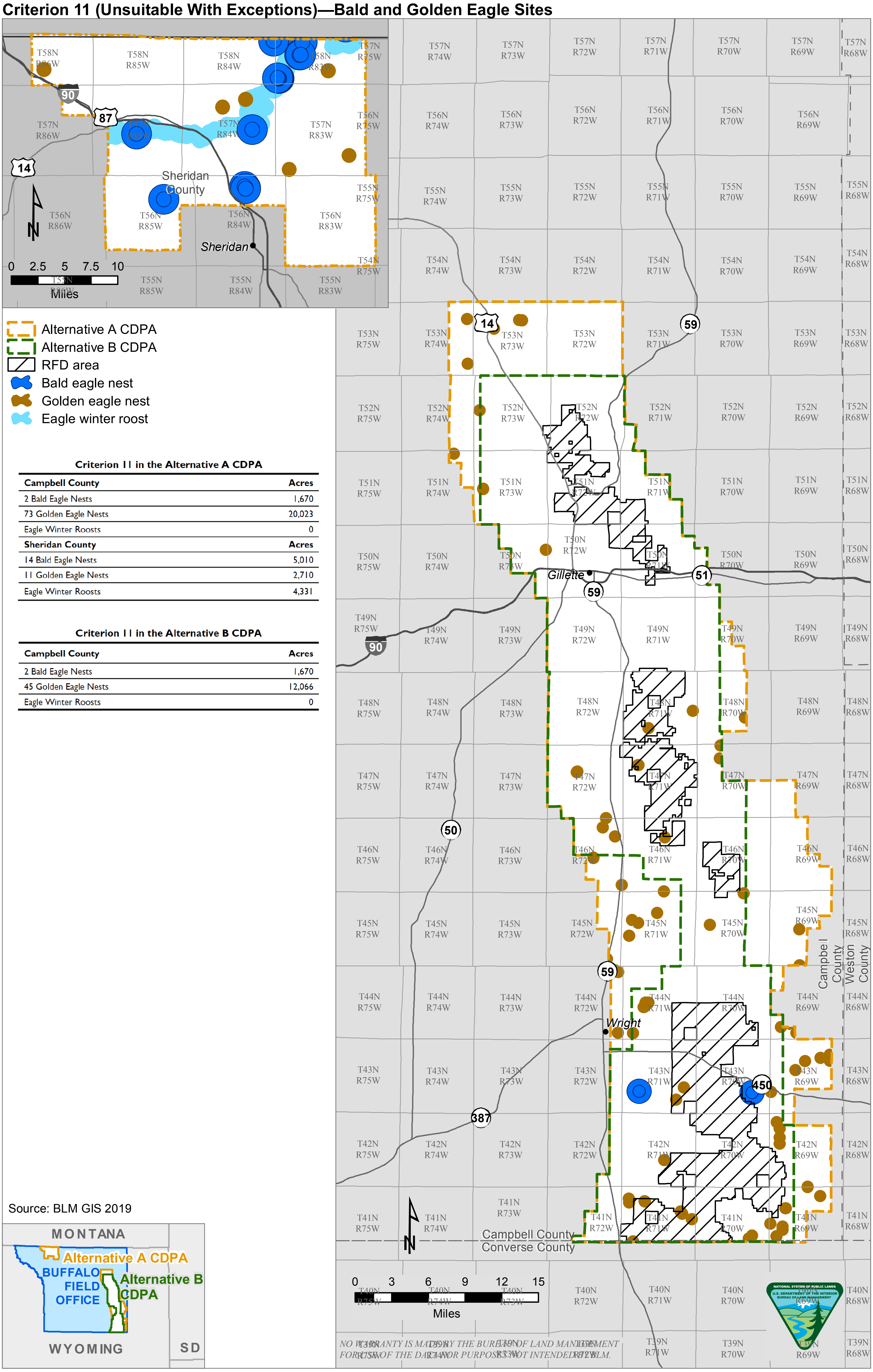
## Figure A-6
## Screen 2 Unsuitability Assessment:
## Criterion 11 (Unsuitable With Exceptions)—Bald and Golden Eagle Sites



**Criterion 11 in the Alternative A CDPA**

| Campbell County | Acres |
|---|---|
| 2 Bald Eagle Nests | 1,670 |
| 73 Golden Eagle Nests | 20,023 |
| Eagle Winter Roosts | 0 |
| **Sheridan County** | **Acres** |
| 14 Bald Eagle Nests | 5,010 |
| 11 Golden Eagle Nests | 2,710 |
| Eagle Winter Roosts | 4,331 |

**Criterion 11 in the Alternative B CDPA**

| Campbell County | Acres |
|---|---|
| 2 Bald Eagle Nests | 1,670 |
| 45 Golden Eagle Nests | 12,066 |
| Eagle Winter Roosts | 0 |

Source: BLM GIS 2019

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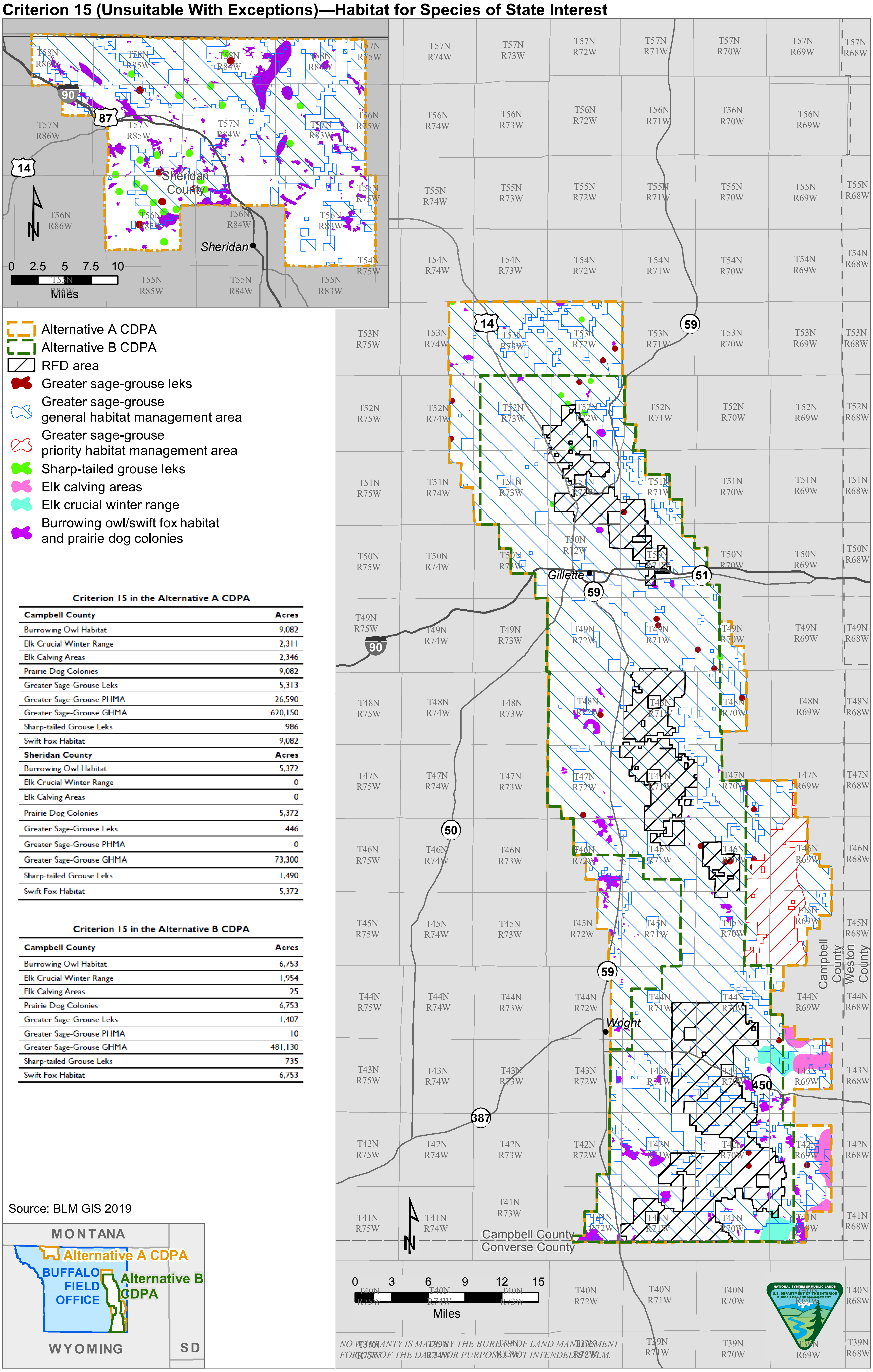
**Figure A-7**
**Screen 2 Unsuitability Assessment:**
**Criterion 15 (Unsuitable With Exceptions)—Habitat for Species of State Interest**



**Criterion 15 in the Alternative A CDPA**

| **Campbell County** | **Acres** |
|---|---|
| Burrowing Owl Habitat | 9,082 |
| Elk Crucial Winter Range | 2,311 |
| Elk Calving Areas | 2,346 |
| Prairie Dog Colonies | 9,082 |
| Greater Sage-Grouse Leks | 5,313 |
| Greater Sage-Grouse PHMA | 26,590 |
| Greater Sage-Grouse GHMA | 620,150 |
| Sharp-tailed Grouse Leks | 986 |
| Swift Fox Habitat | 9,082 |
| **Sheridan County** | **Acres** |
| Burrowing Owl Habitat | 5,372 |
| Elk Crucial Winter Range | 0 |
| Elk Calving Areas | 0 |
| Prairie Dog Colonies | 5,372 |
| Greater Sage-Grouse Leks | 446 |
| Greater Sage-Grouse PHMA | 0 |
| Greater Sage-Grouse GHMA | 73,300 |
| Sharp-tailed Grouse Leks | 1,490 |
| Swift Fox Habitat | 5,372 |

**Criterion 15 in the Alternative B CDPA**

| **Campbell County** | **Acres** |
|---|---|
| Burrowing Owl Habitat | 6,753 |
| Elk Crucial Winter Range | 1,954 |
| Elk Calving Areas | 25 |
| Prairie Dog Colonies | 6,753 |
| Greater Sage-Grouse Leks | 1,407 |
| Greater Sage-Grouse PHMA | 10 |
| Greater Sage-Grouse GHMA | 481,130 |
| Sharp-tailed Grouse Leks | 735 |
| Swift Fox Habitat | 6,753 |

Source: BLM GIS 2019

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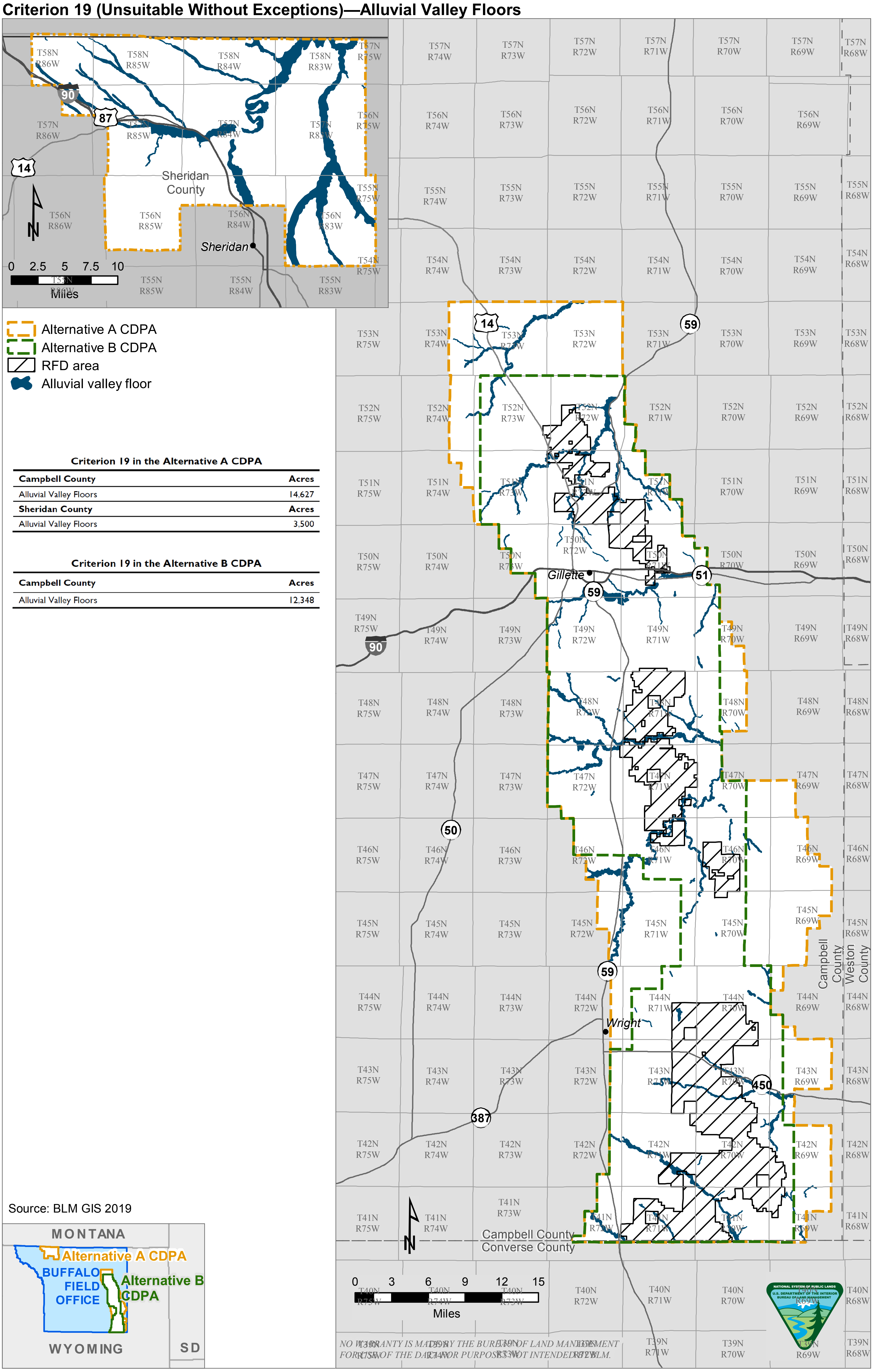
## Figure A-8
## Screen 2 Unsuitability Assessment:
## Criterion 19 (Unsuitable Without Exceptions)—Alluvial Valley Floors



**Criterion 19 in the Alternative A CDPA**

| Campbell County | Acres |
|---|---|
| Alluvial Valley Floors | 14,627 |
| **Sheridan County** | **Acres** |
| Alluvial Valley Floors | 3,500 |

**Criterion 19 in the Alternative B CDPA**

| Campbell County | Acres |
|---|---|
| Alluvial Valley Floors | 12,348 |

Source: BLM GIS 2019

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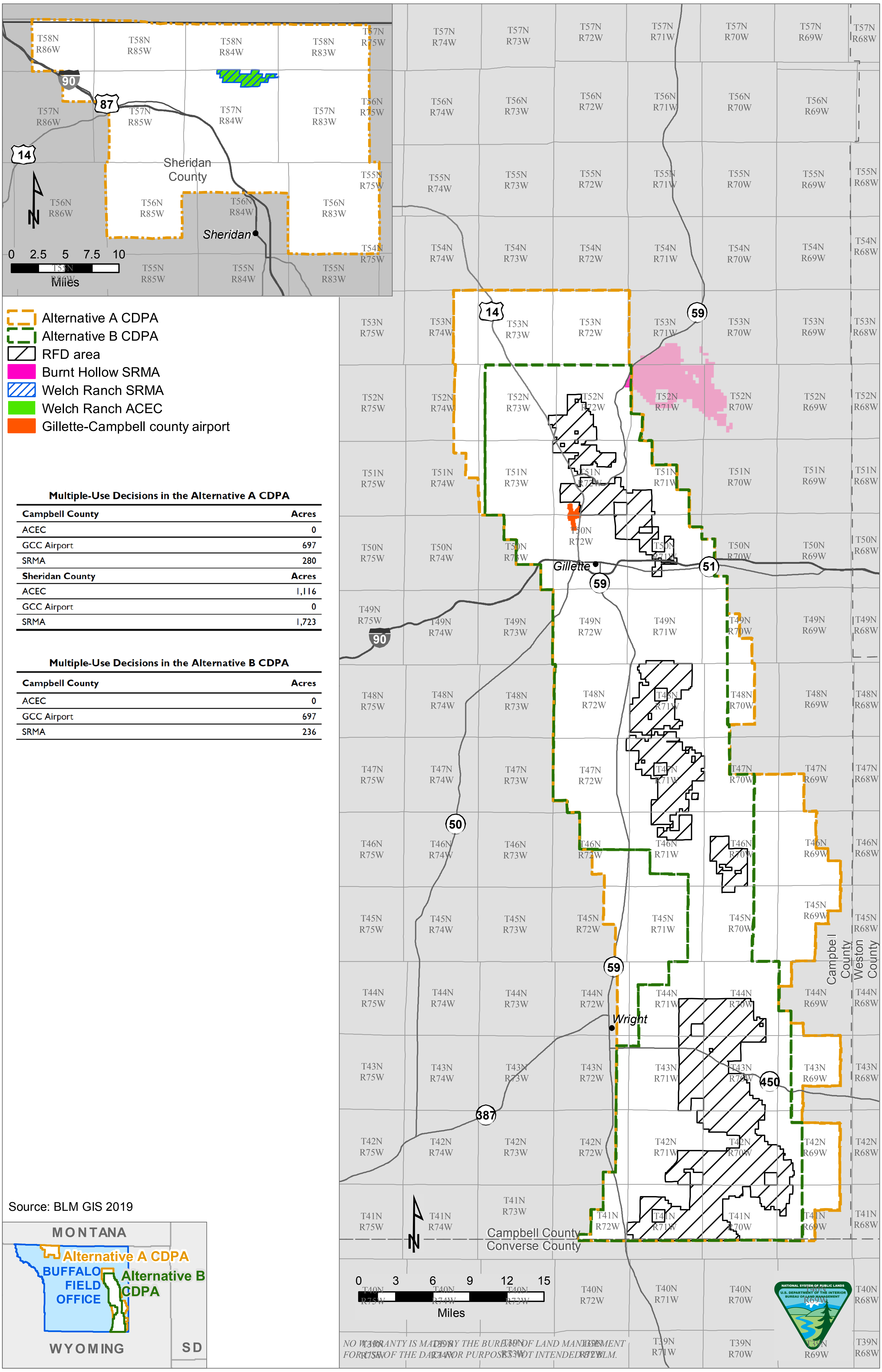
## Figure A-9
## Screen 3 Multiple-Use Decisions (Unacceptable for Leasing)



**Multiple-Use Decisions in the Alternative A CDPA**

| Campbell County | Acres |
|---|---|
| ACEC | 0 |
| GCC Airport | 697 |
| SRMA | 280 |
| **Sheridan County** | **Acres** |
| ACEC | 1,116 |
| GCC Airport | 0 |
| SRMA | 1,723 |

**Multiple-Use Decisions in the Alternative B CDPA**

| Campbell County | Acres |
|---|---|
| ACEC | 0 |
| GCC Airport | 697 |
| SRMA | 236 |

Source: BLM GIS 2019

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# Attachment 1

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United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Buffalo Field Office
1425 Fort Street
Buffalo, WY 82834

In Reply Refer To:
1610

January 30, 2019

RE: Surface Owner Consultation Coal Screen – Supplemental Environmental Impact Statement to the Approved Resource Management Plan for the Buffalo Field Office.

Dear Surface Owner:

On November 28, 2018, the Bureau of Land Management (BLM) published a Notice of Intent (NOI) for a potential amendment to the Approved Resource Management Plan (RMP) for the Buffalo Field Office and to prepare an associated Supplemental Environmental Impact Statement (SEIS). This potential amendment and associated SEIS is in response to a United States Montana District Court opinion and order (Western Organization of Resource Councils, et al vs BLM; CV 16-21-GF-BMM; 3/23/2018 and 7/31/2018).

In response to the order, the BLM is re-evaluating the four coal screens in accordance with 43 CFR 3420.1-4(e). The coal screens include: identification of coal development potential, 20 unsuitability criteria, multiple use conflicts, and surface owner consultation. The BLM has identified your private lands, which overlie federal coal deposits, as lands determined to have potential for coal development.

In accordance with 43 CFR 3420.1-4(e)(4)(i), BLM requests you notify the Buffalo Field Office in writing by **March 1, 2019** on the following information:

1. If you are a surface owner for lands within the coal development potential area identified on the attached map.
2. Your preference for or against mining by other than underground mining techniques on Enclosure 1.
3. Any additional information on your lands that would be beneficial in determining the suitability or unsuitability for coal leasing.

To facilitate this request, the BLM has enclosed a document, Enclosure 1, with the appropriate information being requested. Please use Enclosure 1 to notify the Buffalo Field Office on the points listed above, and return it by using the enclosed envelope by **March 1, 2019**.

Any views provided through this request may be used in the completion of the SEIS and may be available for public review. Before including your address, phone number, e-mail address, or other personal identifying information in your comment, be advised that your entire comment – including your personal identifying information – may be made publicly available at any time. While you can ask us in your comment to withhold, from public view, your personal identifying information, we cannot guarantee that we will be able to do so. All submissions from organizations, from businesses, and from individuals identifying themselves as representatives of organizations or businesses, will be available for public review.

Because this is a planning document, lands considered under this SEIS would be analyzed to determine if they are acceptable for further considerations for coal leasing or unacceptable for further considerations for coal leasing. Leasing decisions would be considered under separate NEPA reviews when an application for leasing is submitted to the BLM. Therefore, the BLM would not be making leasing decisions at this time.

After review of the surface owner consultation responses, the SEIS will be prepared. BLM plans to have the SEIS available for public comment in spring 2019. The SEIS will be posted on the BLM e-Planning website, https://go.usa.gov/xP6S3 or https:eplanning.blm.gov; where the project webpage can be found by conducting a land use plan text search for Wyoming, Buffalo Field Office. Updated information, and associated documents, are also posted on the e-Planning project website.

We look forward to hearing from you on this project. If you have any questions, please contact Tom Bills, Planning and Environmental Coordinator, at (307) 684-1133.

Sincerely,

Todd D. Yeager
Field Manager

Enclosure 1 – Documentation of Surface Owner Consultation
Map – BLM Coal Development Potential Area, Campbell County

Enclosure 1.

Please returned to the Buffalo Field Office by March 1, 2019.

**Please Check One:**

___ I am authorized to express my views as a qualified surface owner in accordance with 43 CFR 3400.0-5(gg), having met the following requirements; I hold legal or equitable title of this land surface. I have my principal residence on this land, or I personally farm or ranch on this land, or I receive a significant portion of my income from farm or ranch operations on this land. I have met the requirements since ________________.

___ I do not meet the requirements for a qualified surface owner in accordance with 43 CFR 3400.0-5(gg). Please explain below.

______________________________________________________________________

______________________________________________________________________

______________________________________________________________________

______________________________________________________________________

Please identify your view(s) on leasing as listed below by aliquot or group of land description also listed below. Multiple views can be identified by aliquot or group land description(s). Provide additional information on the reserve side.

1. I am in favor of leasing of federal coal on these lands. ____
2. I am against leasing of federal coal on these lands. _____
3. I am undecided in favor or opposed to federal coal leasing on these lands. _____
4. I have already given written consent for surface mining of federal coal on these lands. _____

*Before including your address, phone number, e-mail address, or other personal identifying information in your comment, be advised that your entire comment – including your personal identifying information – may be made publicly available at any time. While you can ask us in your comment to withhold, from public view, your personal identifying information, we cannot guarantee that we will be able to do so. All submissions from organizations, from businesses, and from individuals identifying themselves as representatives of organizations or businesses, will be available for public review.*

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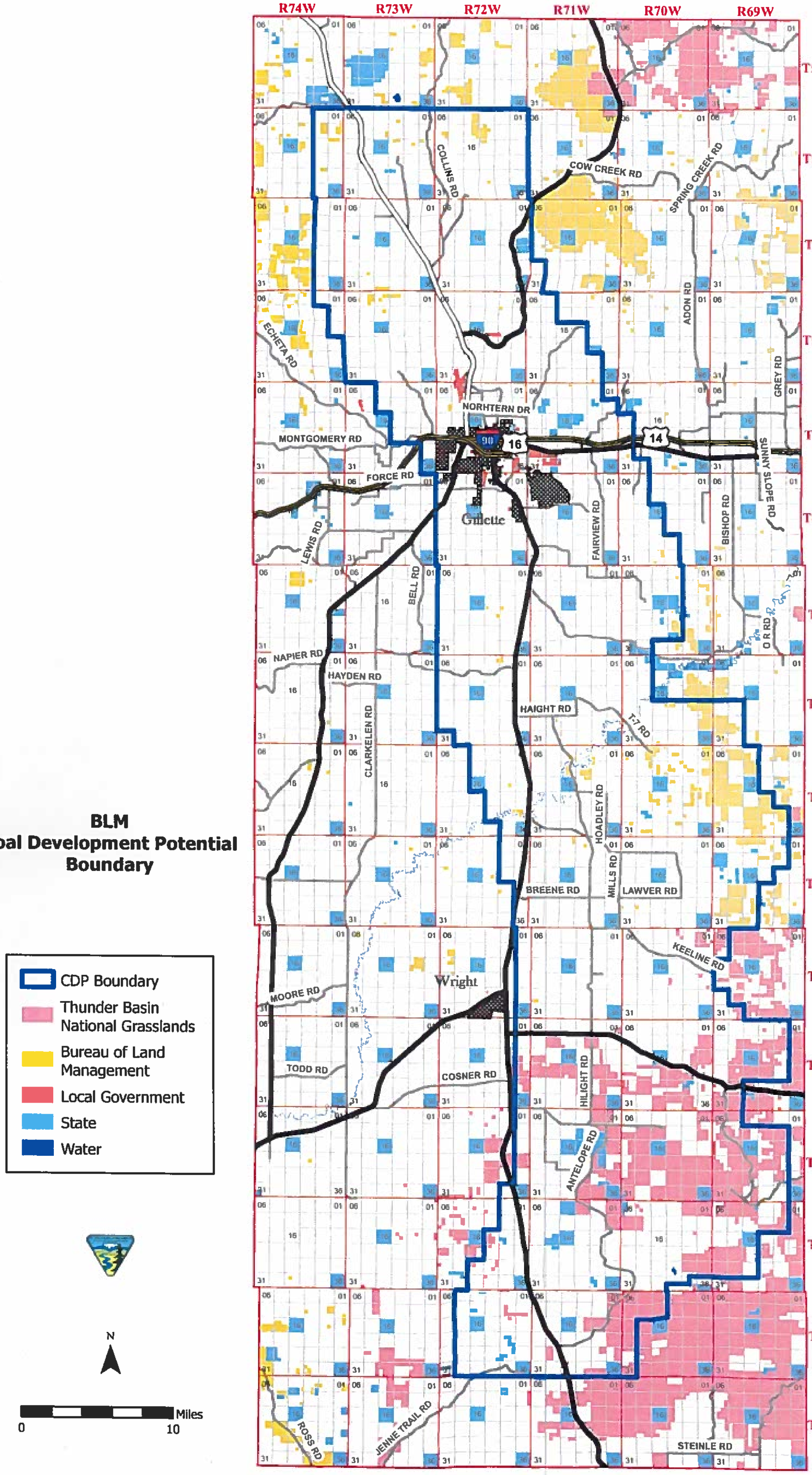
# BLM Coal Development Potential Boundary



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# Appendix B

## Reasonably Foreseeable Development

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# Appendix B. Reasonably Foreseeable Development

## B.1 INTRODUCTION

The US Geological Survey estimated in 2013 that the entire Powder River Basin (PRB) had approximately 162 billion tons of technically recoverable coal and approximately 25 billion tons of economically recoverable coal, depending on price (Scott and Luppens 2013). Most of the easily accessible reserves are federally administered coal resources in the southern PRB. Since 1985, approximately 10.8 billion tons of coal in the planning area were either leased or under consideration for leasing on both federal and non-federal coal estates. The CDPA in the 2015 Proposed RMP/Final EIS identified coal resources with economic potential for development. This area with development potential included 686,896 acres, or 15 percent of the 4.7-million acres of federal coal estate that the BFO administers, and 73.8 billion short tons of coal.

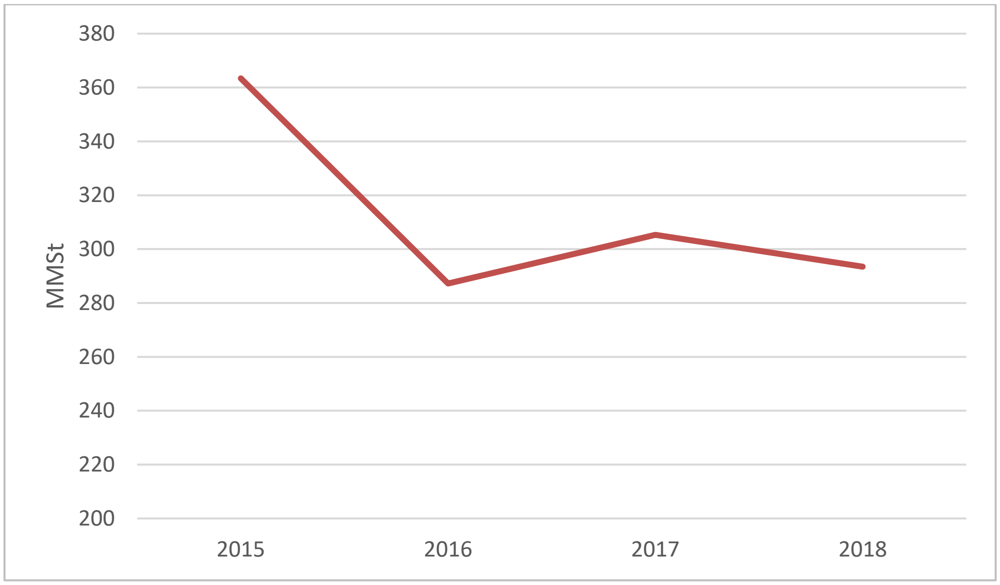
The BFO conducted a coal screening in 2001 and the identified CDPA was carried forward in the 2015 RMP. As part of this SEIS, the BFO reapplied coal screens and conducted a new unsuitability assessment to identify lands in Campbell and Sheridan Counties that are acceptable for further consideration for leasing (**Appendix A**). The new coal screening brought forward 455,467 acres and 52.2 million short tons (MMSt) of coal for further leasing consideration. While this coal screen identified areas with potential to develop, not all coal resources will be developed over the next 20 years; thus, a reasonably foreseeable development (RFD) scenario was developed to project coal development in the CDPA between 2019 and 2038. In the RFD developed for this SEIS, the BLM analyzed energy market projections developed by the US Energy Information Administration (EIA) using the National Energy Modeling System (NEMS), an integrated model that captures interactions of economic changes and energy supply, demand, and prices (EIA 2019).

## B.2 PRODUCTION TRENDS SINCE 2015

The PRB continues to be the largest coal-producing region in the United States. Coal from the southern PRB continues to be used almost exclusively for domestic electric power generation. Coal from this region has grown in its overall share of the domestic market. This is because of its low sulfur content, which enables power plants and other emitters to reduce costs associated with pollution controls, and because its thick coal seams and low stripping ratios allow producers to keep costs low. In 2018, coal accounted for approximately 28 percent of US electric generation, and southern PRB coal accounted for nearly 40 percent of total US coal (EIA 2019).

Since the Record of Decision (ROD) for the BFO RMP was signed in 2015, production by the 12 coal mines operating in the BFO has been declining. In 2015, these mines collectively produced 363.4 MMSt; however, their production dropped by nearly 76.2 MMSt to 287.2 MMSt in total in 2016. While production slightly recovered in 2017, rising to 305.3 MMSt, production fell another 11.8 MMSt to 293.4 MMSt in 2018 (**Figure B-1**). Production numbers in this paragraph are total production (federal and non-federal coal).

**Figure B-1: Annual Production in the Southern Powder River Basin (2015–2018)**



Source: MSHA 2019

Although the BLM accounts for only 1 percent of surface ownership in the southern PRB, federal coal resources are estimated to account for approximately 90 percent of all coal estate there. Based on coal estate ownership, 264.1 MMSt of federal coal was estimated to have been produced across the 12 mines in 2018. As of February 2019, these mines had 131,837 acres of coal estate and 15.1 billion short tons of federal coal under lease. Most of this was under lease by the three most southern mines, where coal is of higher quality and better able to command a price premium. Although production by these mines accounted for 66 percent of total production in the southern PRB in 2018, these mines operated well below the full capacity determined by their Wyoming DEQ permits (Table B-1).

Based on capacity utilization (i.e., annual production as a percent of maximum permitted production under Wyoming DEQ permits) and recoverable reserves held under existing federal leases in 2018, the 12 operating mines are projected to have sufficient reserves, on average, to continue producing for another 20 years (BLM 2019). While mines collectively in these regions have sufficient reserves to support long-term operations, some of the central and southern mines are beginning to run low on remaining recoverable reserves.

**Table B-1**
**Remaining Mining Life Based on 2018 Production**

| Location | Number of Mines | Average Remaining Mine Life | Share of Total Production | Average Capacity Utilization |
|---|---|---|---|---|
| Northern Mines | 5 | 22.1 | 13.1% | 37% |
| Central Mines | 4 | 18.0 | 20.3% | 34% |
| Southern Mines | 3 | 17.6 | 66.6% | 51% |

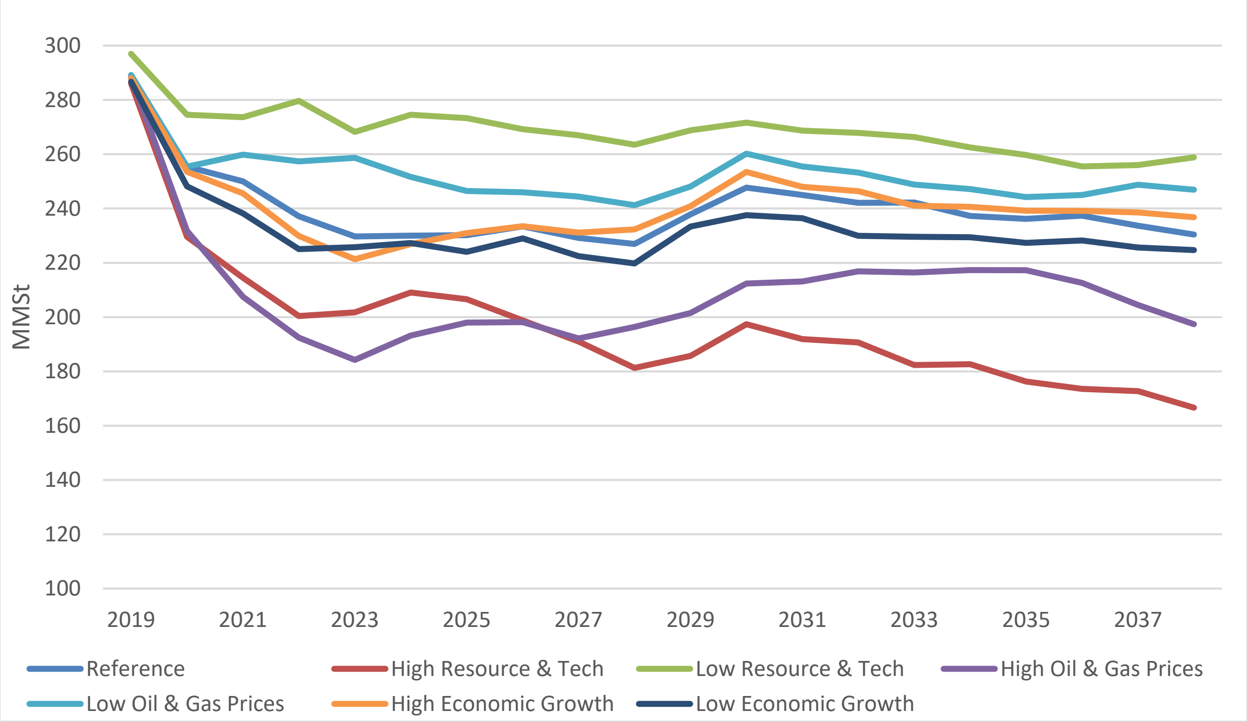
Source: BLM 2019, MSHA 2019

## B.3 FORECAST PRODUCTION TRENDS

Energy market projections are subject to much uncertainty because of the many factors that can influence them, including changes in demographics, economic growth, technological advances, and environmental regulations (EIA 2019). Since coal plays a vital role in worldwide energy markets, forecasts for coal demand and production are also subject to a high level of uncertainty. This is because of the many factors that influence consumption rates, including coal's share of the domestic electric generation fuel mix and delivered coal prices relative to alternative fuel sources.

Forecast fluctuations in annual production over the next 20 years will be attributable to trends in the domestic coal market, US fuel substitution capabilities, and demand in export markets. Between 2019 and 2038, production in the Southern Powder River Basin is anticipated to fall by approximately 1 percent on annual average. As shown in **Figure B-2**, production is forecast to decline through 2023, followed by a short period of growth between 2028 and 2030, and then declining again through 2038. Forecasts influencing trends in the coal market are further discussed below.

**Figure B-2: Annual Production in the Southern Powder River Basin (2019–2038)**



Source: EIA 2019

### B.3.1 Domestic Market

Declining natural gas prices have decreased the competitiveness of coal as a fuel source, and the dominance of natural gas in the fuel generation energy mix is anticipated to grow. As shown in **Figure B-2**, the share of coal in the US fuel generation energy mix is expected to decline in all cases between 2019 and 2038, as prices for natural gas and renewable energy continue to fall, making these increasing competitive fuel source substitutes.

The reduced competitiveness of coal-fired energy generation has already led to several early retirement announcements for a number of inefficient coal-fired power plants through 2025 (EIA 2019). As such, the retirements of inefficient coal-fired power plants are projected to be driven by increasing investment and development of combined-cycle natural gas power generators (EIA 2019). Previous studies have found that natural gas was easily substituted for coal in all US states from 2009 through 2014, with positive cross-price elasticities; however, states that are heavily reliant on coal have limited ability to switch from coal due to the inelasticity of substitution in electricity generation driven by power plants being designed to operate on a particular fuel source (Elbakidze and Zaynutdinova 2016).

Future declines in domestic coal production will be driven by increased cost competitiveness of natural gas and renewables, which is anticipated to cause coal's share of the domestic fuel generation energy mix to fall. Between 2019 and 2038 coal's share of the electricity generation fuel mix is expected to decline from about 28 to 17 percent, while renewables grow from 18 percent to about 26 percent, and natural gas grows from 34 percent to about 38 percent (EIA 2019). The projected lower energy demand of coal, coupled with the retirement of inefficient coal-fired power plants, is expected to yield significant reductions in domestic US coal production. AEO 2019 projects domestic coal production to decrease through 2035, from 762 million short tons in 2018 to 608 million short tons in 2035, before stabilizing around 600 million short tons through the remainder of the analysis period (EIA 2019). The Western Coal Region, which consists of the PRB, is projected to decline by 85 million short tons from 2018 through 2035 (EIA 2019).

### B.3.2 Fuel Substitution

Historically, coal has been a dominant source of the electric generation fuel energy mix, driven primarily by regional and national reliance on it as an energy source for baseload power. While coal prices have waivered, research has found coal to be the most price inelastic with respect to demand, meaning that consumer demand does not change much with respect to price changes (GAO et al. 2013; Elbakidze and Zaynutdinova 2016).

Coal production in the BFO decision area grew to become a significant portion of US coal production, primarily due to the low cost of surface strip mining (IEEFA 2019), and natural gas prices have historically been unable to compete; however, recent price trends have led to the decline of coal use and increase of natural gas use. There the relative cost of coal has been increasing with respect to natural gas dominance in the fuel generation energy mix, due to the increasingly positive elasticity of substitution between natural gas and coal (Elbakidze and Zaynutdinova 2016; EIA 2018; EIA 2012). Due to the own price inelasticity of coal and the associated inability of demand to change with price changes, the increased competitiveness of natural gas has led to substitutions and market changes between the two resources (EIA 2012). An EIA study found that a 10 percent increase in the price of coal relative to natural gas led to a 1.4 percent increase in natural gas usage with respect to coal usage (EIA 2012).

Despite the substitutability of natural gas for coal, other factors play significant roles in the fuel generation energy mix. Power plants and generation units require significant investment costs and infrastructural requirements specific to the fuel source; transitioning power plants to alternative fuel sources are unlikely, due to the economic and infrastructural challenges faced (GAO 2008). Furthermore, the electricity market, as described above, is subject to numerous factors, including the development of technology, environmental regulations, and economic feasibility of alternate resources. While natural gas has the highest cross-price elasticity with coal, other energy sources may become feasible later on; however, these are extremely difficult to predict.

### B.3.3 Export Market and Global Demand

Global markets are difficult to predict, as the factors that affect domestic market demand also occur in the global market and are coupled with trade barriers, transportation costs, and relative intensity of exchange rates.

The Asia Pacific region drives both supply and demand for the global coal market. Asia Pacific has the most proven coal reserves, accounting for approximately 41 percent of the global total, located primarily in Australia, China, and India (Spencer 2018). This drives coal consumption, primarily in India (424 million tons and 11.4 percent of the 2017 global share) and China (1,892 million tons and 50.7 percent) (IEA 2019; BP 2018). As such, the Asia Pacific region also drives the import/export market. The top coal importers in 2016 were China (256 Million tons [Mt]), India (191 Mt), and Japan (190 Mt), while the top exporters were Australia (392 Mt), Indonesia (370 Mt), and Russia (166 Mt) (BGR 2017).

Given the type and quality of US coal, US exports are primarily used to support the global power sector. While there has been growth in global power generation, it has been driven primarily by efforts in Europe for renewable energy (Spencer 2018). The global market for coal has remained relatively stable, accounting for 89.1 percent of world energy resources (BGR 2017). In 2017, global coal consumption increased for the first time in 4 years, driven by population growth and market demand in the Asia Pacific region. Global consumption increased by 1 percent in 2017, the first positive change in coal consumption since 2013, driven by consumption in India (which grew by 18 million tons of oil equivalent [Mtoe]) and China (4 Mtoe) (BP 2018). Coal production also increased in 2017, by approximately 3.2 percent from 2016 levels, as China and the US increased production by 56 Mtoe and 23 Mtoe, respectively (BP 2018). Although global market demand for coal is expected to grow between 2019 and 2038 as coal-fired generation in China and India increases, US exports are expected to remain stable over the same period (IEA 2019; EIA 2018).

## B.4 REASONABLE FORESEEABLE DEVELOPMENT

The RFD for the BFO was developed from projections reported in EIA's Annual Energy Outlook 2019 (AEO 2019). These projections were generated using the NEMS, developed and maintained by the Office of Energy Analysis of the EIA. All forecasts developed for the annual energy outlook reports are modeled projections of what may happen given certain assumptions and methods and not predictions of what will happen (EIA 2019).

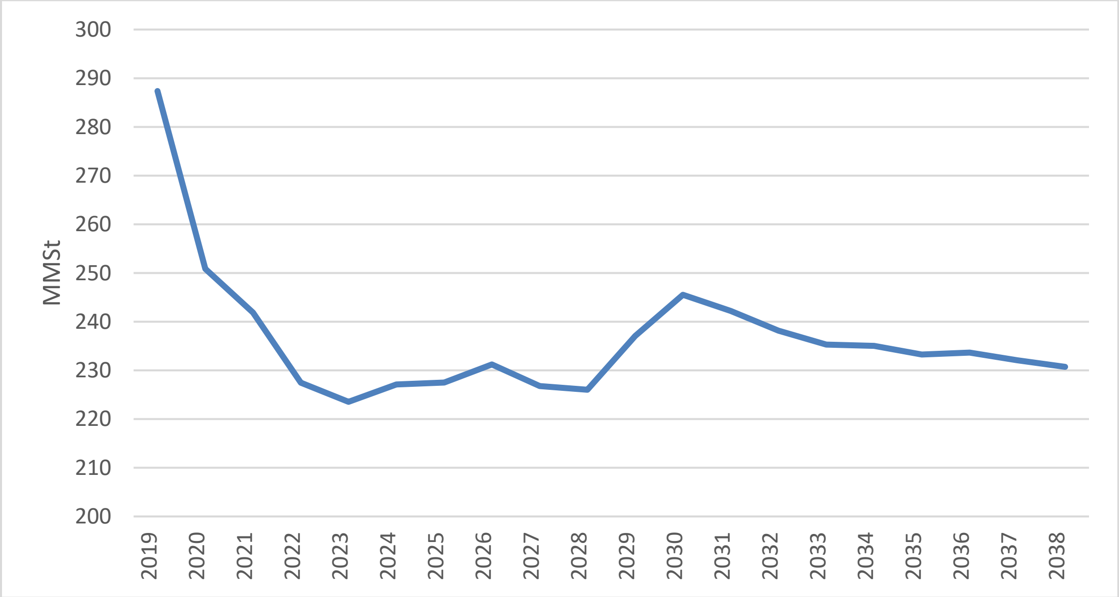
To account for the uncertainty inherent to energy markets, the NEMS uses a reference case and six side cases (high or low oil price, high or low oil and gas resource and technology, and high or low economic growth). Forecasts under the high oil and gas resource and technology scenarios do consider how new technologies, such as carbon fiber and coal to liquid or gas, may affect resource consumption, even though these technologies are highly speculative. As national aggregation is not sufficient to account for the physical and economic characteristics unique to geographical producing regions (Stevens et al 1979), the NEMS takes a regional approach to account for these differences (EIA 2019).

The AEO 2019 projections under the seven scenarios are developed specifically for low-sulfur and medium sulfur sub-bituminous coal in the southern PRB. An RFD scenario for federal and non-federal coal was then developed by averaging annual production forecasts under the high and low economic growth scenarios. This was done because averaging results from these scenarios yielded estimates closest to 2018 production, as reported by the Mine Safety Health Administration. Under this RFD, 243.9 MMSt of coal was projected to be produced on annual average between 2019 and 2038 in the southern PRB.

An RFD for federal coal resources administered by the BFO was further developed, based on projections for low-sulfur sub-bituminous coal and the proportion of total coal resources under federal ownership. Since 90 percent of the region's coal resources are administered by the BLM, this RFD assumed that 90 percent of all low-sulfur sub-bituminous coal production would be produced from federal coal in the CDP.

On annual average, 213 MMSt of federal coal is projected to be produced between 2019 and 2038. As shown below in **Figure B-3**, federal coal production is forecast to steeply decline over the next 4 years. Production will stabilize until 2028 and will pick up until it peaks in 2030. Between 2030 and 2038, production is forecast to steadily decline. In total, 4.2 billion short tons of federal coal are projected to be produced and 36,620 acres will be disturbed in the CDPA over the next 20 years under this RFD.

**Figure B-3: RFD for Federal Coal in the Southern Powder River Basin (2019–2038)**



Although two new mines in Sheridan County have been proposed, their proposed locations would make it highly unlikely for either one to lease or produce federal minerals within the next 20 years. Furthermore, neither mine operator has submitted a formal proposal for review by a regulatory agency; thus, the RFD assumes all federal production between 2019 and 2038 will occur at the 12 mines currently operating in Campbell County.

Changes in production levels over the next 20 years could extend or shorten the remaining life of operating mines as reserves are recovered at faster or slower rates. As the rate at which reserves are recovered changes, mine operators will reassess their operation plans and will determine whether more reserves will need to be leased. As lease by applications are received, the BLM will continue to consider future tracts win the CDPA for leasing.

Although highly speculative at this time, some mine operators could decide to halt operations if demand and pricing remain weak and the recoverable reserves held through their existing leases begin to run low. If mines in the northern or central part of the southern PRB were to close, unused capacity across the three southern mines would be sufficient to absorb the closing mines' market shares by increasing production. In this manner, overall production of low-sulfur sub-bituminous coal from the PRB would be unlikely to be affected by future mine closures, although the distribution of production across operating mines could change.

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# Appendix C

## Air Resources Technical Support Report

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# Appendix C. Air Resources Technical Support Report

This appendix provides additional details on the greenhouse gas (GHG) emission estimates completed for the air resources analysis (see Chapter 3 of the SEIS/RMPA for the Buffalo Field Office. **Tables 3-4** through **3-7** in **Section 3.5.1** of the SEIS/RMPA summarize total GHG emissions in units of carbon dioxide equivalents ($CO_2e$) from federal coal, oil, natural gas, and coal bed natural gas. This appendix details GHG emissions by pollutant.

**Tables C-1** through **C-4** show the GHG emissions for carbon dioxide ($CO_2$), methane ($CH_4$), and nitrous oxide ($N_2O$), the primary compounds that contribute to GHG emissions in the Buffalo Field Office. **Table C-1** presents the $CO_2$, $CH_4$, and $N_2O$ emissions from federal coal production, transportation, downstream combustion and compound totals, while **Table C-2**, **Table C-3**, and **Table C-4** present the $CO_2$, $CH_4$, and $N_2O$ emissions from oil and gas production and downstream combustion processes. Oil and gas transportation emissions are discussed qualitatively in **Section 3.5.1** of the SEIS/RMPA. The emission factors and methods used in the calculations are discussed in **Section 3.5.1**; the data are available in the administrative record for the SEIS/RMPA.

## Table C-1

## $CO_2$, $CH_4$, and $N_2O$ emissions from Federal Coal Production, Transportation, and Combustion

| Year | Federal RFD Coal Production Rate (MMst)[1] | $CO_2$ (MMT)[2] | | | | $CH_4$ (MMT)[2] | | | | $N_2O$ (MMT)[2] | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Prod | Trans | Comb | Total | Prod | Trans | Comb | Total | Prod | Trans | Comb | Total |
| 2019 | 258.6 | NE | 3.9 | 433.5 | 437.4 | 0.23 | 0.000 | 0.05 | 0.28 | NE | 0.00011 | 0.007 | 0.01 |
| 2020 | 225.8 | NE | 3.4 | 378.4 | 381.8 | 0.20 | 0.000 | 0.04 | 0.24 | NE | 0.00010 | 0.006 | 0.01 |
| 2021 | 217.7 | NE | 3.3 | 364.9 | 368.2 | 0.19 | 0.000 | 0.04 | 0.23 | NE | 0.00009 | 0.006 | 0.01 |
| 2022 | 204.7 | NE | 3.1 | 343.1 | 346.2 | 0.18 | 0.000 | 0.04 | 0.22 | NE | 0.00009 | 0.006 | 0.01 |
| 2023 | 201.2 | NE | 3.1 | 337.2 | 340.2 | 0.18 | 0.000 | 0.04 | 0.22 | NE | 0.00009 | 0.006 | 0.01 |
| 2024 | 204.4 | NE | 3.1 | 342.6 | 345.7 | 0.18 | 0.000 | 0.04 | 0.22 | NE | 0.00009 | 0.006 | 0.01 |
| 2025 | 204.7 | NE | 3.1 | 343.2 | 346.3 | 0.18 | 0.000 | 0.04 | 0.22 | NE | 0.00009 | 0.006 | 0.01 |
| 2026 | 208.1 | NE | 3.2 | 348.8 | 352.0 | 0.18 | 0.000 | 0.04 | 0.22 | NE | 0.00009 | 0.006 | 0.01 |
| 2027 | 204.1 | NE | 3.1 | 342.1 | 345.2 | 0.18 | 0.000 | 0.04 | 0.22 | NE | 0.00009 | 0.006 | 0.01 |
| 2028 | 203.4 | NE | 3.1 | 340.9 | 344.0 | 0.18 | 0.000 | 0.04 | 0.22 | NE | 0.00009 | 0.006 | 0.01 |
| 2029 | 213.4 | NE | 3.2 | 357.6 | 360.9 | 0.19 | 0.000 | 0.04 | 0.23 | NE | 0.00009 | 0.006 | 0.01 |
| 2030 | 221 | NE | 3.4 | 370.3 | 373.7 | 0.19 | 0.000 | 0.04 | 0.24 | NE | 0.00010 | 0.006 | 0.01 |
| 2031 | 218 | NE | 3.3 | 365.3 | 368.6 | 0.19 | 0.000 | 0.04 | 0.23 | NE | 0.00009 | 0.006 | 0.01 |
| 2032 | 214.3 | NE | 3.3 | 359.2 | 362.5 | 0.19 | 0.000 | 0.04 | 0.23 | NE | 0.00009 | 0.006 | 0.01 |
| 2033 | 211.8 | NE | 3.2 | 354.9 | 358.1 | 0.19 | 0.000 | 0.04 | 0.23 | NE | 0.00009 | 0.006 | 0.01 |
| 2034 | 211.5 | NE | 3.2 | 354.5 | 357.7 | 0.19 | 0.000 | 0.04 | 0.23 | NE | 0.00009 | 0.006 | 0.01 |
| 2035 | 209.9 | NE | 3.2 | 351.9 | 355.1 | 0.18 | 0.000 | 0.04 | 0.22 | NE | 0.00009 | 0.006 | 0.01 |
| 2036 | 210.3 | NE | 3.2 | 352.5 | 355.6 | 0.19 | 0.000 | 0.04 | 0.23 | NE | 0.00009 | 0.006 | 0.01 |
| 2037 | 208.9 | NE | 3.2 | 350.1 | 353.2 | 0.18 | 0.000 | 0.04 | 0.22 | NE | 0.00009 | 0.006 | 0.01 |
| 2038 | 207.7 | NE | 3.1 | 348.0 | 351.2 | 0.18 | 0.000 | 0.04 | 0.22 | NE | 0.00009 | 0.006 | 0.01 |

[1] MMst: million short tons

[2] Prod=production, Trans=transportation, Comb=combustion. Note coal production emissions for $CO_2$ and $N_2O$ were not included in the 2015 Proposed RMP/Final EIS.

NE = Not estimated. This is because these values were not calculated in the 2015 Proposed RMP/Final EIS. They will be small, compared with the combustion values.

## Table C-2
## $CO_2$, $CH_4$, and $N_2O$ Emissions from Federal Oil Production and Combustion

| Year | Federal RFD Oil Production Rate (MMBO)[1] | $CO_2$ (Metric Tons) [2] | | | $CH_4$ (Metric Tons) [2] | | | $N_2O$ (Metric Tons) [2] | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Prod | Comb | Total | Prod | Comb | Total | Prod | Comb | Total |
| 2019 | 3.4 | 44,044 | 145,799 | 189,843 | 779 | 59 | 837 | 1 | 11 | 13 |
| 2020 | 3.8 | 43,706 | 162,952 | 206,658 | 782 | 65 | 848 | 1 | 13 | 14 |
| 2021 | 4.1 | 41,201 | 175,816 | 217,017 | 749 | 71 | 819 | 1 | 14 | 15 |
| 2022 | 4.7 | 40,403 | 201,545 | 241,949 | 749 | 81 | 830 | 1 | 16 | 17 |
| 2023 | 5.1 | 36,434 | 218,698 | 255,132 | 694 | 88 | 782 | 1 | 17 | 18 |
| 2024 | 5.6 | 31,871 | 240,139 | 272,010 | 632 | 96 | 729 | 1 | 19 | 20 |
| 2025 | 5.8 | 33,009 | 248,716 | 281,725 | 655 | 100 | 755 | 1 | 19 | 20 |
| 2026 | 6.3 | 35,855 | 270,157 | 306,011 | 711 | 108 | 820 | 1 | 21 | 22 |
| 2027 | 6.3 | 35,855 | 270,157 | 306,011 | 711 | 108 | 820 | 1 | 21 | 22 |
| 2028 | 6.7 | 38,131 | 287,309 | 325,441 | 757 | 115 | 872 | 1 | 23 | 24 |
| 2029 | 6.7 | 38,131 | 287,309 | 325,441 | 757 | 115 | 872 | 1 | 23 | 24 |
| 2030 | 6.7 | 38,131 | 287,309 | 325,441 | 757 | 115 | 872 | 1 | 23 | 24 |
| 2031 | 6.7 | 38,131 | 287,309 | 325,441 | 757 | 115 | 872 | 1 | 23 | 24 |
| 2032 | 6.7 | 38,131 | 287,309 | 325,441 | 757 | 115 | 872 | 1 | 23 | 24 |
| 2033 | 6.7 | 38,131 | 287,309 | 325,441 | 757 | 115 | 872 | 1 | 23 | 24 |
| 2034 | 6.7 | 38,131 | 287,309 | 325,441 | 757 | 115 | 872 | 1 | 23 | 24 |
| 2035 | 6.7 | 38,131 | 287,309 | 325,441 | 757 | 115 | 872 | 1 | 23 | 24 |
| 2036 | 6.7 | 38,131 | 287,309 | 325,441 | 757 | 115 | 872 | 1 | 23 | 24 |
| 2037 | 6.7 | 38,131 | 287,309 | 325,441 | 757 | 115 | 872 | 1 | 23 | 24 |
| 2038 | 6.7 | 38,131 | 287,309 | 325,441 | 757 | 115 | 872 | 1 | 23 | 24 |

[1] MMBO=million barrels of oil

[2] Prod=production; Comb=combustion

## Table C-3
## $CO_2$, $CH_4$, and $N_2O$ Emissions from Federal Natural Gas Production and Combustion

| Year | Federal RFD Natural Gas Production Rate (BCF)[1] | $CO_2$ (metric tons) [2] | | | $CH_4$ (metric tons) [2] | | | $N_2O$ (metric tons) [2] | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Prod | Comb | Total | Prod | Comb | Total | Prod | Comb | Total |
| 2019 | 40.8 | 50,910 | 140,747 | 191,657 | 1,907 | 3 | 1,910 | 0.5 | 0.3 | 0.7 |
| 2020 | 47 | 53,172 | 140,747 | 193,919 | 1,994 | 3 | 1,997 | 0.5 | 4.7 | 5.2 |
| 2021 | 54.5 | 55,309 | 162,136 | 217,444 | 2,077 | 3 | 2,080 | 0.5 | 5.5 | 6.0 |
| 2022 | 62.9 | 56,507 | 188,008 | 244,515 | 2,125 | 4 | 2,128 | 0.5 | 6.3 | 6.8 |
| 2023 | 70.3 | 54,967 | 216,986 | 271,952 | 2,071 | 4 | 2,075 | 0.5 | 7.0 | 7.5 |
| 2024 | 77 | 51,237 | 242,513 | 293,750 | 1,936 | 5 | 1,941 | 0.5 | 7.7 | 8.2 |
| 2025 | 80.8 | 53,765 | 551,671 | 605,437 | 2,031 | 10 | 2,042 | 0.5 | 8.1 | 8.6 |
| 2026 | 83.5 | 55,562 | 578,896 | 634,459 | 2,099 | 11 | 2,110 | 0.5 | 8.4 | 8.9 |
| 2027 | 82.7 | 55,030 | 598,241 | 653,270 | 2,079 | 11 | 2,091 | 0.5 | 8.3 | 8.8 |
| 2028 | 79.6 | 52,967 | 592,509 | 645,476 | 2,001 | 11 | 2,013 | 0.5 | 8.0 | 8.4 |
| 2029 | 79.6 | 52,967 | 570,299 | 623,266 | 2,001 | 11 | 2,012 | 0.5 | 8.0 | 8.4 |
| 2030 | 79.6 | 52,967 | 570,299 | 623,266 | 2,001 | 11 | 2,012 | 0.5 | 8.0 | 8.4 |
| 2031 | 79.6 | 52,967 | 570,299 | 623,266 | 2,001 | 11 | 2,012 | 0.5 | 8.0 | 8.4 |
| 2032 | 79.6 | 52,967 | 570,299 | 623,266 | 2,001 | 11 | 2,012 | 0.5 | 8.0 | 8.4 |
| 2033 | 79.6 | 52,967 | 570,299 | 623,266 | 2,001 | 11 | 2,012 | 0.5 | 8.0 | 8.4 |
| 2034 | 79.6 | 52,967 | 570,299 | 623,266 | 2,001 | 11 | 2,012 | 0.5 | 8.0 | 8.4 |
| 2035 | 79.6 | 52,967 | 570,299 | 623,266 | 2,001 | 11 | 2,012 | 0.5 | 8.0 | 8.4 |
| 2036 | 79.6 | 52,967 | 570,299 | 623,266 | 2,001 | 11 | 2,012 | 0.5 | 8.0 | 8.4 |
| 2037 | 79.6 | 52,967 | 570,299 | 623,266 | 2,001 | 11 | 2,012 | 0.5 | 8.0 | 8.4 |
| 2038 | 79.6 | 52,967 | 570,299 | 623,266 | 2,001 | 11 | 2,012 | 0.5 | 8.0 | 8.4 |

[1] BCF=billion cubic feet; Sum of conventional natural gas and coalbed natural gas

[2] Prod=production; Comb=combustion

## Table C-4
## CO2, CH4, and N2O Emissions from Federal Coalbed Natural Gas Production and Combustion

| Year | Federal RFD Natural Gas Production Rate (BCF)[1] | $CO_2$ (metric tons) [2] | | | $CH_4$ (metric tons) [2] | | | $N_2O$ (metric tons) [2] | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Prod | Comb | Total | Prod | Comb | Total | Prod | Comb | Total |
| 2019 | 40.8 | 14,860 | 2,080,405 | 2,095,264 | 11,739 | 39 | 11,778 | 0.1 | 3.8 | 3.9 |
| 2020 | 47 | 14,635 | 2,396,544 | 2,411,179 | 11,310 | 45 | 11,356 | 0.1 | 4.4 | 4.5 |
| 2021 | 54.5 | 14,091 | 2,778,972 | 2,793,063 | 10,549 | 53 | 10,602 | 0.1 | 5.1 | 5.2 |
| 2022 | 62.9 | 12,939 | 3,207,290 | 3,220,230 | 9,214 | 61 | 9,275 | 0.1 | 5.9 | 6.0 |
| 2023 | 70.3 | 10,748 | 3,584,619 | 3,595,366 | 6,989 | 68 | 7,056 | 0.1 | 6.6 | 6.7 |
| 2024 | 77 | 7,704 | 3,640,209 | 3,647,913 | 4,030 | 69 | 4,099 | 0.1 | 6.7 | 6.7 |
| 2025 | 80.8 | 8,084 | 3,819,856 | 3,827,940 | 4,229 | 72 | 4,301 | 0.1 | 7.0 | 7.1 |
| 2026 | 83.5 | 8,354 | 3,947,499 | 3,955,853 | 4,370 | 75 | 4,445 | 0.1 | 7.3 | 7.3 |
| 2027 | 82.7 | 8,274 | 3,909,679 | 3,917,953 | 4,328 | 74 | 4,402 | 0.1 | 7.2 | 7.2 |
| 2028 | 79.6 | 7,964 | 3,763,125 | 3,771,089 | 4,166 | 71 | 4,237 | 0.1 | 6.9 | 7.0 |
| 2029 | 79.6 | 7,964 | 3,763,125 | 3,771,089 | 4,166 | 71 | 4,237 | 0.1 | 6.9 | 7.0 |
| 2030 | 79.6 | 7,964 | 3,763,125 | 3,771,089 | 4,166 | 71 | 4,237 | 0.1 | 6.9 | 7.0 |
| 2031 | 79.6 | 7,964 | 3,763,125 | 3,771,089 | 4,166 | 71 | 4,237 | 0.1 | 6.9 | 7.0 |
| 2032 | 79.6 | 7,964 | 3,763,125 | 3,771,089 | 4,166 | 71 | 4,237 | 0.1 | 6.9 | 7.0 |
| 2033 | 79.6 | 7,964 | 3,763,125 | 3,771,089 | 4,166 | 71 | 4,237 | 0.1 | 6.9 | 7.0 |
| 2034 | 79.6 | 7,964 | 3,763,125 | 3,771,089 | 4,166 | 71 | 4,237 | 0.1 | 6.9 | 7.0 |
| 2035 | 79.6 | 7,964 | 3,763,125 | 3,771,089 | 4,166 | 71 | 4,237 | 0.1 | 6.9 | 7.0 |
| 2036 | 79.6 | 7,964 | 3,763,125 | 3,771,089 | 4,166 | 71 | 4,237 | 0.1 | 6.9 | 7.0 |
| 2037 | 79.6 | 7,964 | 3,763,125 | 3,771,089 | 4,166 | 71 | 4,237 | 0.1 | 6.9 | 7.0 |
| 2038 | 79.6 | 7,964 | 3,763,125 | 3,771,089 | 4,166 | 71 | 4,237 | 0.1 | 6.9 | 7.0 |

[1] Sum of conventional natural gas and coalbed natural gas

[2] Prod=production; Comb=combustion

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# Appendix D

## Economic Technical Appendix

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# Appendix D. Economic Technical Appendix

This appendix is intended to provide additional information on the assumptions and methods used to assess impacts to the attitudes, values, and beliefs (AVBs) discussed in **Section 3.5.2** of this SEIS.

## D.1 LOCAL ECONOMIC OPPORTUNITIES AND EMPLOYMENT

While there is no fixed definition for economic opportunity, most agree that it corresponds to the realization of personal potential and the ability to profit from one's work. This can be achieved through self-employment, or by working for an employer. In relation to the purpose and need outlined in **Section 1.1**, this analysis limited its focus to local economic opportunities and employment supported by economic activity in the coal sector. Qualitative and quantitative was collected to determine the significance of this industry to the regional social and economic environment. An economic contribution analysis was further conducted to measure how employment and labor income generated in the coal sector further generates additional economic opportunities and employment in other sectors of the regional economy. AVBs associated with local economic opportunities and employment would be supported by economic activity in the coal sector, and declines in local economic opportunities and employment would be considered not to support these AVBs.

The first step in conducting the contribution analysis was to obtain from the Mine Safety and Health Administration the 2018 production and employment data for the 12 mines operating in the BFO. This data was then used to estimate an average production volume per job that could be applied to annual federal production levels forecasted under the RFD (**Appendix B**). Next, a regional input-output model for the seven counties was generated using IMPLAN software and databases,[1] and response coefficients for a job change in employment in the coal sector were obtained. These response coefficients were then applied to direct employment supported by federal coal production under the RFD to estimate its annual direct, indirect, and induced economic contributions. Economic contributions were measures in terms of jobs, income, and economic output (i.e., value of production). As described in **Section 3.5.2,** direct contributions are those in the coal industry, indirect contributions are those in the coal industry's supply chain, and induced contributions are those in industries where direct and indirect labor wages are spent.

Projected annual average contributions over the next 20 years are reported in **Section 3.5.2**. The RFD forecasts periods of both rising and declining production (**Appendix B**). Economic activity (i.e., jobs, income and the value of output in industries) will fluctuate with production levels. Annual average contributions during these periods of expansion and contraction are reported below.

---

[1] IMPLAN is a platform that combines a set of extensive databases, economic factors, multipliers, and demographic statistics with a highly refined modeling system that is fully customizable. It is one of the most widely used input-output models for conducting regional economic analyses. More information on IMPLAN software and databases is available at: https://www.implan.com/

### Table D-1
### Average Annual Economic Contributions (2019–2023) in Millions of 2018 Dollars

| Type of Effect | Employment | Labor Income | Output |
|---|---|---|---|
| Direct | 3,551 | $ 407.2 | $ 410,717,961 |
| Indirect | 3,085 | $ 258.5 | $ 87,236,627 |
| Induced | 2,430 | $ 99.0 | $ 38,115,647 |
| **Total** | **9,066** | **$ 764.7** | **$ 536,070,235** |

### Table D-2
### Average Annual Economic Contributions (2024–2027) in Millions of 2018 Dollars

| Type of Effect | Employment | Labor Income | Output |
|---|---|---|---|
| Direct | 3,291 | $ 377.3 | $ 380,577,410 |
| Indirect | 2,859 | $ 239.5 | $ 80,834,765 |
| Induced | 2,252 | $ 91.8 | $ 35,318,529 |
| **Total** | **8,402** | **$ 708.6** | **$ 496,730,704** |

### Table D-3
### Average Annual Economic Contributions (2028–2030) in Millions of 2018 Dollars

| Type of Effect | Employment | Labor Income | Output |
|---|---|---|---|
| Direct | 3,407 | $ 390.6 | $ 394,021,847 |
| Indirect | 2,960 | $ 247.9 | $ 83,690,367 |
| Induced | 2,331 | $ 95.0 | $ 36,566,206 |
| **Total** | **8,698** | **$ 733.5** | **$ 514,278,420** |

### Table D-4
### Average Annual Economic Contributions (2031–2038) in Millions of 2018 Dollars

| Type of Effect | Employment | Labor Income | Output |
|---|---|---|---|
| Direct | 3,390 | $ 388.7 | $ 392,086,562 |
| Indirect | 2,945 | $ 246.7 | $ 83,279,312 |
| Induced | 2,320 | $ 94.5 | $ 36,386,606 |
| **Total** | **8,655** | **$ 729.9** | **$ 511,752,480** |

## D.2 MINERAL REVENUES AND FUNDING FOR PUBLIC SERVICES

As discussed in **Section 3.5.2**, Wyoming and local governments, municipalities, and special districts rely heavily on revenues generated from mineral leasing and production. Forty-nine percent of federal mineral receipts are disbursed to Wyoming and distributed according to its statutes. Wyoming also assesses a severance tax on all minerals extracted in the state. These revenues are distributed to statewide funds and local governments according to a legislatively established two-tier formula.

In addition to federal and state revenues, federal production and the facilities and equipment at mines are also subject to county property taxes, known as ad valorem taxes. While local governments may receive a small disbursement of mineral revenues from the State, ad valorem mineral revenues account for a much larger share of total revenues at the county level each year. This is vital funding for school districts, libraries, workforce centers, public safety services, and public works projects. AVBs associated with the provision of these public services are supported by mineral revenues generated from the production of coal; declines in the funding for and provision of these services would be considered not to support these AVBs.

Since federal, State, and local mineral revenues are based on the value of production, with the exception of federal rents, they are highly responsive to changes in market conditions. As production changes in response to changes in price and demand, so does the assessed value of production subject to set royalties and tax rates. Projected mineral revenues under the RFD were estimated, based on a number of assumptions, including annual production levels, projected coal prices over the next 20 years, royalty and tax rates, and the number of federal coal acres under lease. Assumptions for the various calculations are reported below in Table D-5. Average annual mineral revenue estimates for the four time periods reported above are included in **Tables D-6** through **D-9**.

**Table D-5**
**Assumptions for Estimating Mineral Revenues Between 2019 and 2038**

| Type | Assumptions |
|---|---|
| Production | Annual production was provided by the RFD (**Appendix B**). The southernmost mine straddles the Campbell and Converse county line and currently produces one-third of its annual production from minerals in Converse County. Coal tracts in Converse County are anticipated to be mined out within the next 10 years. |
| Price | A weighted average price was estimated by averaging EIA price forecasts for Wyoming Powder River Basin coal under the high and low economic growth scenarios and weighting average prices by annual production under the RFD. |
| Federal royalties | Federal royalties were estimated at 12.5% of the market value of federal mineral production. |
| Federal rents | Rents on federal leases were estimated at $3 per acre. Since it is highly uncertain how many acres will be held under lease over the next 20 years, acreage subject to annual rents was held constant even though acreages may change as areas are mined out or additional tracts are leased |
| Severance taxes | State severance taxes were estimated at 7% of market value of federal mineral production. |
| Ad valorem | Ad valorem taxes were estimated based on a 59.88 mill levy on the market value of federal production in Campbell County and 65.75 mill levy on the market value of federal mineral production in Converse County. |

## Table D-6
## Average Annual Mineral Revenues (2019–2023) in Millions of 2018 Dollars

| Type of Effect | Mineral Revenues |
|---|---|
| Federal[1] | $ 360.3 |
| State | $ 201.4 |
| Local | $ 171.9 |

[1] Although collected by the federal government, 49 percent of these receipts are returned to the state of Wyoming. These disbursements are not reported below in state generated revenues

## Table D-7
## Average Annual Mineral Revenues (2019–2023) in Millions of 2018 Dollars

| Type of Effect | Mineral Revenues |
|---|---|
| Federal[1] | $ 333.9 |
| State | $ 186.6 |
| Local | $ 159.3 |

[1] Although collected by the federal government, 49 percent of these receipts are returned to the state of Wyoming. These disbursements are not reported below in state generated revenues

## Table D-8
## Average Annual Mineral Revenues (2019–2023) in Millions of 2018 Dollars

| Type of Effect | Mineral Revenues |
|---|---|
| Federal[1] | $ 345.7 |
| State | $ 193.2 |
| Local | $164.8 |

[1] Although collected by the federal government, 49 percent of these receipts are returned to the state of Wyoming. These disbursements are not reported below in state generated revenues

## Table D-9
## Average Annual Mineral Revenues (2019–2023) in Millions of 2018 Dollars

| Type of Effect | Mineral Revenues |
|---|---|
| Federal[1] | $ 344.0 |
| State | $ 192.2 |
| Local | $ 163.7 |

[1] Although collected by the federal government, 49 percent of these receipts are returned to the state of Wyoming. These disbursements are not reported below in state generated revenues

## D.3 OTHER RESOURCES

Many values associated with other affected resources have nothing to do with how these resources stimulate economic activity, generate revenues, or contribute to gross domestic product. While people often do not have to pay to gain access to these natural resources, they still derive satisfaction and well-being from their interactions with the environment. These interactions can include both direct on-site interactions and those independent of their direct use. Commonly referred to as passive use values, these non-use values can include those derived from knowing the resource exists, knowing there is the option to use the resource in the future, off-site interactions, and knowing that future generations will also have the ability to derive value from the resource. Collectively, these use and passive use values influence the AVBs by which individuals view resources and impacts on these resources. AVBs associated with biological and physical resources will be supported when actions do not adversely affect them, and adverse impacts on these resources would be considered not to support these AVBs.

### D.3.1 Biological and Physical Resources

AVBs associated with air, water, and wildlife generally relate to their overall quality. People often acknowledge that they care about and derive value from clean air and water and healthy wildlife. AVBs associated with these resources generally support conservation and coincide with negative AVBs toward environmental degradation, as degradation can adversely affect the health of these resources.

Impacts on air resources were analyzed in terms of emissions generated from oil and gas development forecast in the RFD for the 2015 BFO RMP and the RFD for coal development outlined in **Appendix B**. These impacts are discussed in Section 4.1.1 of the 2015 Proposed RMP/Final EIS and **Section 3.5.1** of this SEIS/RMPA.

Impacts on wildlife were determined based on possible surface disturbances in areas with development potential carried forward through the suitability screen. Impacts on wildlife are discussed in **Section 3.5.3**, Biological Resources, of this SEIS/RMPA. Potential adverse impacts on these resources would be considered not to support these AVBs.

#### *Social Cost Metrics*

A subset of AVBs associated with air resources directly pertain to GHGs and climate change. During public scoping, the BLM received several comments advocating for the supplement environmental review in response to the opinion and order of the United States District Court, District of Montana (*Western Organization of Resource Councils, et al. vs. BLM*) to include monetary estimates of damages associated with GHGs and climate change. Other commenters argued that environmental reviews under NEPA are required to monetize the social costs of GHGs and climate change when the economic benefits of fossil fuel extraction have been monetized, and that the social cost of carbon and social cost of methane must be used to analyze and disclose the significance of emissions resulting from management of oil gas and coal under the SEIS/RMPA. While the BLM did consider using these metrics, they were ultimately not carried forward for analysis for the reasons outlined below.

NEPA requires agencies to take a hard look at environmental impacts and to document the reasonably foreseeable effects of the alternatives considered for a decision on a major governmental action. Under 40 CFR 1508(a) and (b), those effects may include "ecological . . . , aesthetic, historical, cultural, economic, social, or health, whether direct, indirect, or cumulative."

Direct effects are defined as those that are "caused by the action and occur at the same time and place." Indirect effects are defined as those "which are caused by the action and are later in time or farther removed in distance but still reasonably foreseeable." Cumulative impact is defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions." Under 40 CFR 1508.8(b), effect is considered to be synonymous with impact.

Neither NEPA nor the Council on Environmental Quality's NEPA supporting regulations mandate the use of specific analytical methods. Additionally, the regulations provide a considerable latitude in what issues are considered significant and the degree and type of analysis that must be conducted to provide sufficient information for the decision-maker to make an informed decision. Importantly, a principle direction of NEPA is to ensure that presently unquantifiable environmental amenities and values are given appropriate consideration in decision-making, along with economic and technical considerations.

While NEPA requires the BLM to consider GHG emissions, including quantifying direct and indirect emissions, courts have upheld that NEPA does not require these emissions to be monetized or that social cost metrics be used (*Sierra Club v. FERC*, *WildEarth Guardians v. United States Forest Service*, *WildEarth Guardians v. Jewell*). Social cost metrics provide estimates for the economic damages associated with an increase in carbon dioxide , methane , or other GHG emissions. They are typically expressed as a dollar amount per 1 metric ton increase in emissions in a particular year. Estimates often include monetary estimates of potential changes in net agricultural productivity, human health, and property damages from increased flood risk over hundreds of years. There are multiple methods for forecasting and monetizing these social costs, and there are other existing and legally defensible methods for quantifying and analyzing the reasonably foreseeable climate impacts from GHG emissions.

One concern with including social cost estimates in this SEIS/RMPA is that monetary estimates of the social cost of GHGs are not as useful for informing decisions when other costs and benefits have not been monetized. Without other monetized estimates of impacts, including those on other resources, and of social benefits realized through industrial efficiencies, technological advances, and time savings, there is no context in which to interpret these social costs.

While monetary values are often discussed in NEPA documents, they typically describe the effect of the action on economic activity, in terms of revenue, employment, labor income, total value added, and output. These effects are a measure of an economic impact, rather than an economic benefit, as these terms are used in economic theory and method (Watson et al. 2007; Kotchen 2011).

Economic impacts describe how money spent or generated by an action will affect the jobs and business activity in a defined region. **Section 3.5.2** provides estimates of changes in economic activity and mineral revenues, in relation to expressed attitudes, values, and beliefs associated with local economic opportunities and employment and mineral revenues and funding for public services; nevertheless, changes in jobs, income, and revenues are not expressed as benefits or costs, thus they are not directly comparable to monetary estimates of the social cost of GHGs. Changes in the metrics used to discuss these issues may be perceived as benefits by certain individuals, such as employees, local governments, or residents, but they may be perceived as costs to others, such as the employer and local governments.

Additionally, social cost metrics were determined not to be the most relevant metrics for inclusion in this supplemental environmental review. This is because they should be applied to net impacts on global GHG emissions or concentrations, which are not typically estimated for BLM management actions. The analysis required to estimate net global GHG impacts evaluates energy and electricity markets to estimate how the use and production of other fuels would change to compensate for the increase or decrease in production at a particular location. This analysis is complex, has significant data requirements, and is beyond the scope of analysis because it does not meet the underlying purpose and need outlined in **Section 1.1**.

Research has indicated that for difficult environmental issues, such as climate change, most people more readily understand if the issue is brought to a scale that is relatable to their everyday life (Dietz 2013). When the science and technical aspects are presented in an engaging way, such as narratives about the potential implications of the climate impacts (Corner, Lewandowsky, Phillips, and Roberts 2015); the information is relevant to the audience and links local and global scales of climate change (National Research Council 2010).

While the BLM did not monetize economic damages associated with climate change, it did adopt another approach to quantitatively and qualitatively communicate impacts on air resources, including GHGs and climate change. Since emission estimates can be hard to interpret in isolation, so the air analysis conducted in support of this SEIS/RMPA discussed them in relation to emissions at varying scales (i.e., state, national, and global) and in terms of more tangible equivalencies, such as power plants and wind turbines. The BLM also considered the environmental consequences of these emissions by converting non-carbon GHG emissions into carbon dioxide equivalents ($CO_2e$) and estimating the global warming potential for these $CO_2e$, in order to measure the global warming impacts across different gases (**Tables 3-4** through **3-7**). The BLM further considered potential impacts of climate change on people and recognized that shifts in precipitation and temperatures may adversely affect human health and safety in a number of ways.

## D.4 REFERENCES

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# Appendix E

## Coordination and Consultation

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# Appendix E. Coordination and Consultation

## E.1 INTRODUCTION

This appendix describes the public outreach and participation opportunities associated with developing this SEIS/RMPA. As part of the process, the BLM consulted and coordinated with tribes, government agencies, and other stakeholders.

The BLM conducts land use planning in accordance with NEPA requirements, CEQ regulations, and DOI and BLM policies and procedures for implementing NEPA. NEPA and associated laws, regulations, and policies require the BLM to seek public involvement early in and throughout the planning process. This is to develop a reasonable range of alternatives to proposed actions and to prepare environmental documents that disclose the potential impacts of proposed actions and alternatives.

The BLM involved the public and other agencies by way of *Federal Register* notices, public and informal meetings, individual contacts, media releases, and the SEIS/RMPA website. This involvement was at the heart of the planning process leading to this document.

## E.2 PUBLIC COLLABORATION AND OUTREACH

Public involvement is a vital and legal component of the SEIS/RMPA process. Public involvement vests the public in the decision-making process and allows for full environmental disclosure. Guidance for implementing public involvement under NEPA is codified in 40 CFR 1506.6, thereby ensuring that federal agencies make a diligent effort to involve the public in the NEPA process.

The BLM involved the public in the SEIS/RMPA during the following phases:

- Scoping before NEPA analysis to determine the scope of issues and alternatives to be addressed in the RMP/EIS
- During development of alternatives to be considered in the SEIS/RMPA
- Collaboration with federal, state, local, and tribal governments, and cooperating agencies

The public scoping phase has been completed and is described below; the public outreach and collaboration phases are ongoing throughout the SEIS/RMPA process. The public can obtain information from the project's ePlanning website, https://go.usa.gov/xP6S3.

## E.3 PUBLIC SCOPING

The purpose of the public scoping process is to identify issues and planning criteria that should be considered in the SEIS/RMPA and to initiate public participation in the planning process. Detailed information about public scoping can be found in the Buffalo SEIS and RMP Amendment Scoping Report, available on the project's ePlanning website, https://go.usa.gov/xP6S3.

### E.3.1 Public Notification

#### *Notice of Intent*

The formal public scoping process for the SEIS/RMPA began with the publication of the NOI in the *Federal Register* on November 28, 2018 (FR Doc. 2018–25845); the BLM also posted the NOI on the project website (https://go.usa.gov/xP6S3). The BLM notified the public of its intent to prepare the SEIS/RMPA for the 2015 Buffalo Field Office Approved Resource Management Plan. It is in response to a United States District Court, District of Montana, opinion and order. The NOI included a call for coal and other resource information and identified SEIS topics. The scoping period lasted 30 days, ending on December 28, 2018.

#### *Project Website*

The BLM maintains a project website with information related to the development of the SEIS: https://go.usa.gov/xP6S3. The website includes background documents, maps, public meeting information, and contact information.

#### *News Releases*

During the public scoping period, the BLM sent press releases to 30 newspapers and websites, 8 television stations, and 13 radio stations in the region, announcing public involvement opportunities, scoping meetings, and educational forums. The complete list of media outlets is included as Appendix B of the Buffalo SEIS and RMP Amendment Scoping Report, available on the project's ePlanning website, https://go.usa.gov/xP6S3.

#### *Other Notifications*

In addition to issuing press releases, the BLM notified the public about the scoping process via a variety of sources. Local and regional articles and news bulletins regarding some aspect of the SEIS/RMPA process were published in newspapers, both in and outside of the planning area.

#### *Scoping Meetings*

Following publication of the NOI for the SEIS/RMPA, the BLM conducted one scoping meeting in Gillette, Wyoming, on December 19, 2018. The meeting began with a PowerPoint presentation describing the purpose of the SEIS/RMPA, project approach, and opportunities for public involvement. Materials presented and additional information can be found in the Buffalo SEIS and RMP Amendment Scoping Report, available on the project's ePlanning website: https://go.usa.gov/xP6S3.

#### *Scoping Comments Received*

The BLM received 37 unique written comment letters during the public scoping period, November 29 to December 28, 2018. These submissions contained 278 unique comments. Detailed information about the comments and the public outreach process can be found in the Buffalo Supplemental EIS and RMP Amendment Scoping Report, available on the project's ePlanning website: https://go.usa.gov/xP6S3. The issues identified during public scoping and outreach helped us refine the list of planning issues, which guided the development of alternatives management strategies for the SEIS/RMPA.

## E.4 MAILING LIST

The BLM initially compiled a mailing list of over 63 individuals, agencies, and organizations who had participated in past BLM projects. Attendees at all public meetings were added to the mailing list if they wanted to receive or continue to receive project information. In addition, all individuals or organizations who submitted scoping comments were added to the mailing list.

Through this process, the BLM was able to revise the mailing list to remove undeliverable addresses and to add new interested parties. The mailing list currently includes approximately 84 entries. Throughout the planning process, the BLM will continue to accept requests to be added to or to remain on the official SEIS/RMPA distribution list. The complete mailing list is included as part of the administrative record.

## E.5 LIST OF PREPARERS

### Table E-1
### List of Preparers

| Affiliation/Preparer | Name | Role/Responsibility |
|---|---|---|
| BLM Interdisciplinary Team | Todd Yeager | Buffalo Field Manager |
| | Thomas Bills | Planning and Environmental Specialist (SEIS/RMPA Team Lead) |
| | Casey Freise | Assistant Field Manager—Lands and Minerals |
| | Chris Durham | Assistant Field Manager—Resources |
| | Walter Loewen | Wyoming State Office Planner |
| | Melissa Hovey | Air Quality Specialist |
| | Jennifer Dobb | Economist |
| | Arnie Irwin | Soil Scientist |
| | Brent Sobotka | Hydrologist |
| | Amber Haverlock | Realty Specialist |
| | Georges L. "Buck" Damone III | Archaeologist |
| | Scott Rickard | Economist |
| | Dusty Hill | Geologist |
| | Shari Ketcham | Biologist |
| | Dusty Kavitz | GIS Specialist |
| | Will Robbie | Petroleum Engineer |
| | Steve Wright | Coal Program Manager |
| Environmental Management and Planning Solutions, Inc. (EMPSi) | David Batts | Program Manager |
| | Holly Prohaska | Project Manager |
| | Katie Patterson | Leasable Minerals (Oil, Gas, Coal) |
| | Francis Craig | Minerals; Public Heath |
| | Zoe Ghali | Social and Economic |
| | Angelo Sisante | Social and Economic |
| | Meredith Zaccherio | Vegetation and Special Status Plants |
| | Matthew Smith | Soil and Water Resources |
| | Julie Remp | Wildlife and Special Status Wildlife |
| | Amy Cordle | Air Quality and Climate Change |
| | Derek Holmgren | Water Resources |
| | Peter Gower, AICP, CEP | Lands and Realty/Rights-of-Way/Renewable Energy |
| | Kevin Doyle | Paleontological Resources |
| | Derek Holmgren | Visual Resources |
| Ramboll | Krish Vijayaraghavan | Air Quality and Climate Change |
| | Ralph Morris | Air Quality and Climate Change |
| | Courtney Taylor | Air Quality and Climate Change |
| | Susan Kemball-Cook, PhD | Air Quality and Climate Change |
| | Tom Whitehead, PG | Soils and Geography |

## E.6 TRIBAL CONSULTATION

Consultation with Native American tribes is part of the NEPA scoping process and a requirement of FLPMA. On November 9, 2018, the BFO sent letters to the following tribes, inviting them to be cooperating agencies and to assist with the SEIS/RMPA. In the letters, the BLM also asked if the tribes wanted to initiate formal government-to-government consultation. No tribes responded to the request; however, the BLM will continue to inquire throughout development and implementation of the SEIS/RMPA.

**Table E-2**
**Tribes Contacted for Government-to-Government Consultation**

| Tribal Government |
|---|
| Cheyenne River Sioux |
| Crow |
| Crow Creek Sioux |
| Eastern Shoshone |
| Ft. Peck/Assiniboine/Sioux |
| Lower Brule Sioux |
| Northern Arapahoe |
| Northern Cheyenne |
| Oglala Sioux |
| Rosebud Sioux |
| Santee Sioux |
| Sisseton-Wahpeton Oyate |
| Spirit Lake Tribe |
| Standing Rock Sioux |
| Yankton Sioux |

## E.7 AGENCY CONSULTATION

As part of the SEIS/RMPA process, the BFO will consult with the USFWS for the Endangered Species Act Section 7[1] requirement. Consultation with the USFWS will continue through completion of the final SEIS/RMPA.

The BFO will initiate Section 106 consultation with the State Historic Preservation Office under the National Historic Preservation Act[2] to identify and protect cultural resources in the decision area. The BFO will continue to coordinate with the State Historic Preservation Office until it receives concurrence for the proposed project and completion of the final SEIS/RMPA.

## E.8 COOPERATING AGENCIES

The BLM is the lead agency for the SEIS/RMPA. The BLM wrote to 12 local, state, and federal agencies, inviting them to participate as cooperating agencies for the SEIS/RMPA. Nine representatives agreed to participate as designated cooperating agencies.

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[1] The Endangered Species Act directs all federal agencies to work to conserve endangered and threatened species. Section 7 of the act is the mechanism by which federal agencies ensure the actions they take do not jeopardize the existence of any listed species.

[2] Section 106 of the National Historic Preservation Act requires federal agencies to consider the effects of federally funded projects on historic properties.

## Table E-3
## Cooperating Agency Participation

| Agencies Invited to be Cooperators |
|---|
| Campbell County Commission |
| Johnson County Commission |
| Sheridan County Commission |
| Campbell County Conservation District |
| Sheridan County Conservation District |
| Office of the Governor, Wyoming |
| Wyoming Department of Agriculture |
| Wyoming Department of Environmental Quality |
| Wyoming Department of Game and Fish |
| United States Environmental Protection Agency, Region 8 |
| United States Department of the Interior, Office of Surface Mining and Reclamation |
| United States Department of the Interior, Fish and Wildlife Service |

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# Appendix F

## Glossary

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# Appendix F. Glossary

**1976 Federal Leasing Law.** The 1976 Federal Leasing Law mandates that 49 percent of collected federal royalties are returned to the state where natural resource extraction occurred. The remainder of the collected federal royalty rates are distributed to federal funds and administration fees.

**Ad valorem tax.** Ad Valorem Taxes are imposed by counties within Wyoming and vary from county to county. Ad Valorem percentages are based on mill levies, where a one percent Ad Valorem tax is assessed on the taxable value of production per 10 mill levies in a county.

**Alluvial valley floor**. The unconsolidated stream laid deposits holding streams where water availability is sufficient for sub-irrigation or flood irrigation agricultural activities but does not include upland areas which are generally overlain by a thin veneer of colluvial deposits composed chiefly of debris from sheet erosion, deposits by unconcentrated runoff or slope wash, together with talus, other mass movement accumulation and windblown deposits.

**Area of critical environmental concern.** Area where special management attention is needed to protect and prevent irreparable damage to important historic, cultural, and scenic values, fish, or wildlife resources, or other natural systems or processes; or to protect human life and safety from natural hazards.

**Best management practices (BMPs).** A suite of techniques that guide or may be applied to management actions to aide in achieving desired outcomes. BMPs are often developed in conjunction with land use plans, but they are not considered a planning decision unless the plans specify that they are mandatory.

**Big game crucial winter range.** Winter habitat on which a wildlife species depends for survival. Because of severe weather conditions or other limiting factors, no alternative habitat would be available.

**Coal development potential area.** The area determined to have potential for coal development, using coal stripping ratios in accordance with the first required coal screen under 43 CFR 3420.1-4.

**Coal excise tax.** A production tax levied on domestic coal production within the United States. Revenue is collected by the IRS and funds the Black Lung Disability Trust Fund (BLDTF). Coal Excise Taxes were restructured at the beginning of CY 2019 to $0.25 per short ton of produced coal but may not exceed 2 percent of the market value of production.

**Connectivity habitat.** Connectivity habitats (as defined in Wyoming EO 2015-4) are state-designated areas identified as important for to maintain transmission of genetic material between core area populations. It may not include breeding, late brood-rearing, or winter habitats. Along with core habitat, connectivity habitat is one of two components of PHMA.

**Core population area.** Core habitats (as defined in Wyoming EO 2015-4) are state-designated areas identified as the most important for Greater Sage-Grouse and include breeding, late brood-rearing, and winter habitats. It does not include known migration or connectivity corridors or winter concentration areas. Along with connectivity habitat, core habitat is one of two components of PHMA.

**Critical habitat.** An area occupied by a threatened or endangered species "on which are found those physical and biological features: (1) essential to the conservation of the species, and (2) which may require special management considerations or protection" (as defined under the ESA of 1973).

**Crucial habitat.** Parts of the habitat necessary to sustain a wildlife population at critical periods of its life cycle. This is often a limiting factor on the population, such as breeding or winter habitat.

**Cultural resource.** The present expressions of human culture and the physical remains of past activities, such as historic buildings, structures, objects, districts, landscapes, and archaeological sites. These resources can be significant in the context of national, regional, or local history, architecture, archaeology, engineering, or culture. They also may include sacred sites and natural features of landscapes that are significant to living communities.

**Decision area.** This area is where the BLM administers federal land that contains coal in the BFO.

**Downstream combustion:** Combustion of coal, oil or gas at a location different from the place of production or development.

**Endangered species.** Any species that is in danger of extinction throughout all or a significant portion of its range, as determined by the US Fish and Wildlife Service.

**General habitat management area (GHMA).** An area of seasonal or year-round Greater Sage Grouse habitat outside of priority habitat.

**Habitat.** In wildlife management, the major elements of habitat are considered to be food, water, cover, and living space. The definition includes the following two usages: a species-specific environment or environmental conditions suitable for occupancy by that species, or; a particular land cover type that provides an environment or environmental conditions suitable for occupancy by many species.

**Historic property.** Cultural resources—such as historic buildings, structures, objects, districts, or archaeological sites—that are listed on, or eligible for inclusion on, the National Register of Historic Places.

**IMPLAN.** IMPLAN (Impact Analysis for Planning) is an Input-Output model designed to identify regional economic impacts in response to a change in the economy.

**Invasive species.** A nonnative species whose introduction does or is likely to cause economic or environmental harm or harm to human health.

**Lek.** A traditional breeding area for Greater Sage-Grouse and sharp-tailed grouse in which males assemble to establish dominance, display, and breed. These areas are usually open areas with short vegetation within sagebrush habitats, usually on broad ridges, benches, or valley floors where visibility and hearing acuity are excellent. Also called dancing grounds or strutting grounds.

**Metric ton.** A unit of weight equal to 1,000 kilograms (2,205 pounds).

**Mine Mouth.** Mine Mouth Electric Plants are coal-burning electricity generating power plans that purchase directly from coal mines. They report prices to the Energy Information Administration Agency (EIA) within the US Department of Energy.

**National Register of Historic Places (NRHP).** A listing of resources that are considered significant at the national, state, or local level and that have been found to meet specific criteria of historic significance, integrity, and age.

**Occupied lek.** A lek that has been active during at least one strutting season within the last 10 years.

**Office of Natural Resource Revenue.** The Office of Natural Resource Revenue is an office with the US Department of Interior responsible for collecting, accounting, and verifying natural resource and energy revenues due to States, American Indians, and the US Treasury.

**Priority habitat management area (PHMA).** Areas that have been identified as having the highest conservation value to maintaining sustainable Greater Sage-Grouse populations; they include breeding, late brood-rearing, and winter habitats. Core population areas and connectivity habitat, as described in Wyoming EO 2015-4, are PHMA.

**Raptor.** Bird of prey with sharp talons and strongly curved beaks (hawks, falcons, owls, and eagles).

**Recoverable reserves.** Recoverable reserves represent the tonnage of coal that can be recovered from existing coal reserves at producing coal mines.

**Reasonably Foreseeable Development (RFD) area.** This is the area of current leases and leases by application for the BFO. It includes 141,762 acres in Campbell County.

**Riparian habitat.** An area of land directly influenced by permanent water. It has visible vegetation or physical characteristics reflective of permanent water influence. Lakeshores and streambanks are typical riparian areas. Excluded are such sites as ephemeral streams or washes that do not exhibit the presence of vegetation dependent upon free water in the soil.

**Section 106 process.** Refers to a section of the National Historic Preservation Act of 1966 (NHPA) that requires Federal agencies to take into account the effects of their actions on historic properties. The NHPA created the Advisory Council on Historic Preservation (ACHP) and authorized the ACHP to issue regulations governing the implementation of Section 106. These regulations are set forth in 36 C.F.R. Part 800.

**Section 7 consultation.** The requirement of Section 7 of the ESA that all federal agencies consult with the USFWS or the National Marine Fisheries Service if a proposed action might affect a federally listed species or its critical habitat.

**Sensitive species.** Species designated as sensitive by the BLM State Director include species that are under status review, have small or declining populations, live in unique habitats, or require special management. BLM Manual 6840 provides policy and guidance for special status species management. The BLM Wyoming Sensitive Species Policy and List are provided in a memorandum updated annually. Primary goals of the BLM Wyoming policy include maintaining vulnerable species and habitat components in functional BLM ecosystems and preventing a need for species listing under the Endangered Species Act.

**Severance tax.** Severance Taxes are statewide taxes imposed on the extraction of natural resources intended for consumption. The Severance Tax rate for Wyoming is 7 percent.

**Short ton.** A unit of mass equal to 2,000 pounds.

**Special status species.** Special status species are species proposed for listing, officially listed as Threatened, Endangered, proposed, or are candidates for listing as Threatened or Endangered under the provisions of the Endangered Species Act; those listed by a state in a category implying potential endangerment or extinction; and those designated by the State Director as sensitive.

**Stripping ratio**. The amount of overburden that must be removed to gain access to a similar amount of coal.

**Threatened species.** Any species that is likely to become Endangered within the foreseeable future throughout all or a significant portion of its range, as determined by the US Fish and Wildlife Service.

**Tons.** The equivalent of 2,000 pounds. All tons in this EIS are short tons.

**Vegetation community.** An assemblage of plant populations in a common spatial arrangement.

**Vegetation type.** A plant community with distinguishable characteristics described by the dominant vegetation present.

**Waterway.** Any body of water including lakes, rivers, streams, and ponds whether or not they contain aquatic life.

**Wetlands.** Areas that are inundated or saturated by surface or groundwater often and long enough to support and under normal circumstances do support a prevalence of vegetation typically adapted for life in saturated soil conditions. BLM Manual 1737, Riparian-Wetland Area Management, includes marshes, shallow swamps, lakeshores, bogs, muskegs, wet meadows, estuaries, and riparian areas as wetlands.

# Appendix G

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# Appendix H

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